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Revision of *Zelodia* (Hymenoptera, Braconidae, Agathidinae) from Thailand

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Abstract

The species of Thai *Zelodia* (Hymenoptera: Braconidae: Agathidinae) are revised. Twenty-one species are treated, 19 new species are described, i.e. *Zelodia charoeni*, *Zelodia chongkraii*, *Zelodia cholathorni*, *Zelodia idrisi*, *Zelodia nikomi*, *Zelodia nopadoli*, *Zelodia pahangensis*, *Zelodia panyaii*, *Zelodia poonsathii*, *Zelodia ratanae*, *Zelodia saksiti*, *Zelodia surachaii*, *Zelodia suyaneeae*, *Zelodia toyae*, *Zelodia uthaii*, *Zelodia wangi*, *Zelodia wichaii*, *Zelodia wirati*, *Zelodia wirotei*. A dichotomous key to species is presented; links to electronic interactive keys and to distribution maps are also included.

Keywords

Thailand, Insecta, identification key, taxonomy, systematics

Introduction

Agathidinae is a moderately large subfamily of Braconidae with 1,061 described species worldwide and 238 in the Oriental Region (Yu et al. 2005) though there are an estimated 2,000–3,000 species awaiting description worldwide (Sharkey et al.

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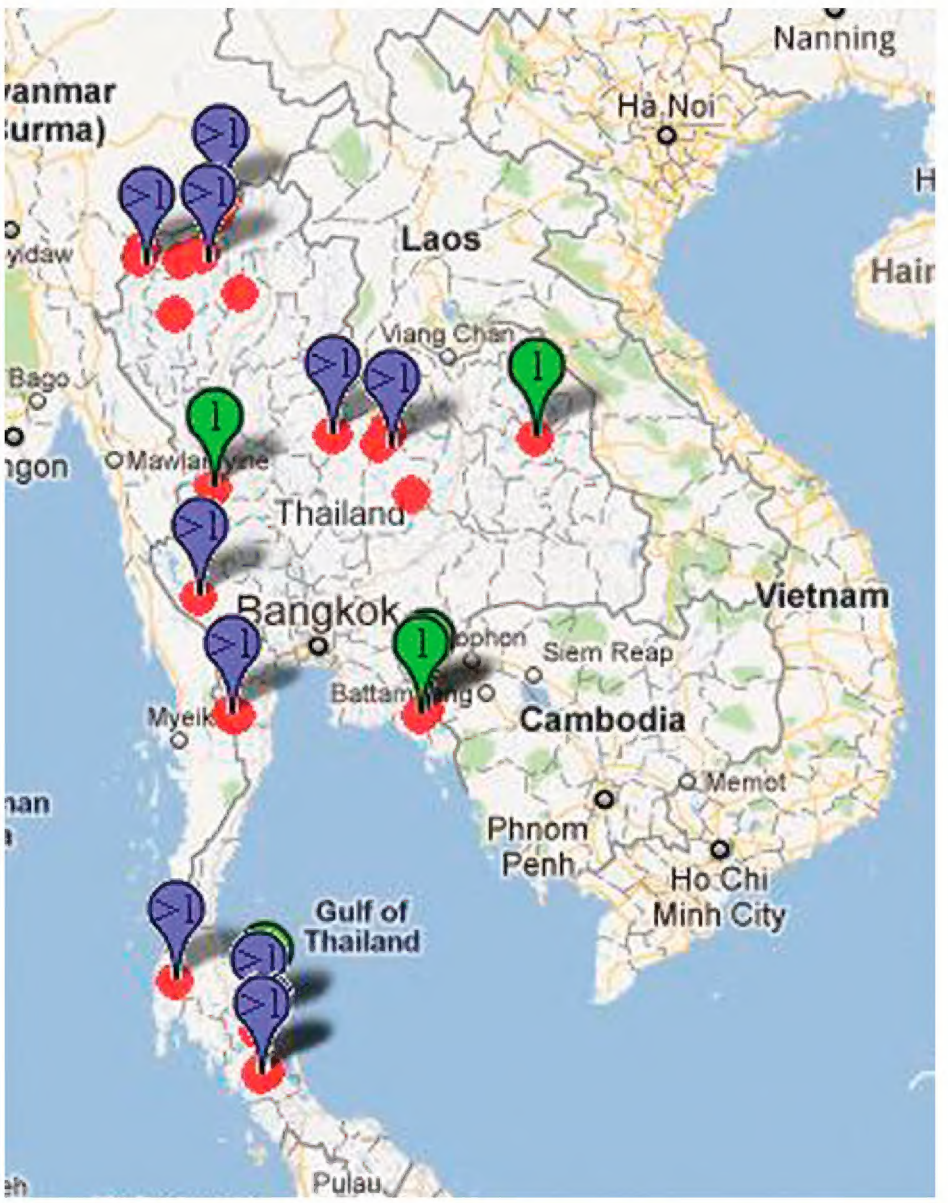


Figure 1. Map showing collection sites in Thailand.

2006). The subfamily has a worldwide distribution and members are found in most terrestrial habitats. The history of higher classification of the Agathidinae was summarized by Sharkey (1992) who also proposed a tribal level classification based on ground-plan coding. Sharkey et al. (2006) conducted phylogenetic analyses based on morphology and the D2–3 regions of 28S rDNA. The Oriental fauna of Agathidinae was first revised by Bhat and Gupta (1977) and they provided a detailed history of taxonomic research for the area. Sharkey et al. (2009) revised the Oriental genera of Agathidinae. Achterberg and Long (2010) revised the Vietnamese agathidine fauna, erected the genus *Zelodia*, described 5 new species of *Zelodia* and transferred 20 species to *Zelodia*, mostly from *Coccygidium* and *Zelomorpha*. Sharkey and Clutts (2011) revised the Thai species of *Biroia, Braunsia*, *Camptothlipsis, Coccygidium, Cremnops, Cremnoptoides, Disophrys, Earinus, Gyrochus, Lytopylus*, and *Troticus,* and included a key to the Agathidinae genera of the Oriental region. This paper is the second in a series to revise all Thai species of Agathidinae. The genera *Aneurobracon, Bassus, Euagathis*, and *Therophilus* will be dealt with in subsequent publications.

Methods

As part of the inventory of Thai insects, we ran three Malaise traps at 30 different localities throughout Thailand from 2007-2010, comprising approximately 90 Malaise trap years. The specimens dealt with here are primarily from these traps.

Species concepts are based on morphological data and cytochrome *c* oxidase (COI) data. Phenetic and phylogenetic trees, using 558 base pairs of COI data, were constructed using neighbor-joining (NJ), maximum parsimony (MP) and Bayesian methods. MP was performed using TNT (Goloboff et. al, 2008) [traditional search with 100 random addition sequences followed by branch-swapping, saving 100 trees per replication; 1000 bootstrap replications were used to estimate branch reliability]. The Bayesian analysis was performed using MrBayes v3.1.2 (Ronquist and Huelsenbeck 2003). Best-fitting DNA substitution models were determined using MrModeltest2.2 (Nylander 2004). The general time reversible model of evolution with a parameter for invariant sites and rate heterogeneity modeled under a gamma distribution (GTR+I+G) was determined as the best-fitting model. The Bayesian analysis consisted of two independent Bayesian MCMC runs initiated from different random starting trees. The analysis ran for 2,000,000 generations, reaching a topological similarity criterion of 0.01; trees were sampled every 500 generations. 25% of the trees from each run were removed as burn-in upon topological convergence. The NJ tree was produced from PAUP* (Swofford 2002) using default settings. Figure 2 presents the NJ tree, which was much more resolved than were the phylogenetic trees produced by MP and Bayesian analyses. We mapped the support values of the Bayesian and MP analyses on the NJ tree. Branches without values are those that collapsed in the phylogenetic analyses.

The dichotomous key, descriptions, and the interactive key (Appendices 1–3) were generated using DELTA Editor Dallwitz et al. (1999), DELTA Dallwitz et al. (1993), and Intkey Dallwitz et al. (1995).

Morphological terms follow Sharkey and Wharton (1997) except for the following: measurements are given for the length and apical width of the first metasomal mediotergite (MT1). Measurement of the apical width is straightforward, however since the base of the tergite is usually hidden from view it is difficult to measure the total length. Instead we measure from the apex of the large tendon that emanates from the propodeum and inserts near the base of the median tergite. Abbreviations used in text: S1, S2, S3; metasomal mediosternite 1, 2, 3; MT1, MT2, MT3: metasomal mediotergite 1, 2, 3; LT1, LT2, LT3: metasomal laterotergite 1, 2, 3.

Morphological terms used in this revision were matched to the Hymenoptera Anatomy Ontology (HAO, Yoder et al. 2010) (Appendix 4). Identifiers (URIs) in the format http://purl.obolibrary.org/obo/HAO_XXXXXXX represent anatomical concepts in HAO version http://purl.obolibrary.org/obo/hao/2011-05-18/hao.owl. They are provided to enable readers to confirm their understanding of the anatomical structures

being referenced. To find out more about a given structure, including, images, references, and other metadata, use the identifier as a web-link, or use the HAO:XXXXXXX (note colon replaces underscore) as a search term at http://glossary.hymao.org.

All 19 species are treated with a diagnosis and distributional data. They are illustrated with color photos using a JVC digital camera mounted on a Leica MZ16 microscope and Automontage® stacking software. Distributional data are listed for all species and a Google map via Berkeley Mapper is included for all species. The descriptions are of the holotype and variation is given in parentheses.

The source files for the keys, descriptions, illustrations, DNA sequence and distributional data are all freely available to future researchers who may wish to build on this beginning. DNA trace files and primer information are available through the Barcode of Life Data system (BOLD) [Ratnasingham and Hebert 2007] at http://www.boldsystems.org. Sixteen of the twenty five *Zelodia* COI sequences were generated by BOLD (project ASTRK Revisions of Thai Agathidinae Braconids), the remaining nine were generated in the Sharkey lab. All sequences have been deposited in GenBank database (JQ763436–JQ763460). All twenty five *Zelodia* COI sequences are characterized by a -1 frameshift mutation. A majority of Agathidinae CO1 sequences are distinguished by a series of 1 bp deletions which are not restricted to one portion of the barcode region. Codon composition in sequences with 1bp deletions remains highly biased towards AT and substitutions remain biased towards 3rd codon position (M. Alex Smith pers. comm.). It is suggested that the genes are correctly decoded by a programmed frameshift during translation (Beckenbach et al. 2005) and are functional.

Distribution data, pdf's of non-copyright references, images, notes, and host and type information can be found by searching TaxaBank (a combined specimen and taxonomic database; http://purl.org/taxabank). Codes beginning with an "H" and followed by numbers are unique identifiers used for specimens in the Sharkey lab at the University of Kentucky, and in the specimen database TaxaBank (e.g., H647).

Abbreviations used for specimen depositories are as follows:

BMNH	The Natural History Museum, London, England.
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, USA.
HIC	Hymenoptera Institute Collection, University of Kentucky, Department of Entomology, Lexington, Kentucky, USA.
QSBG	Queen Sirikit Botanic Gardens, Chiang Mai, Thailand.
RMNH	NCB Naturalis Collection [formerly Rijksmuseum van Natuurlijke Historie], Leiden, Netherlands.
UKM	Universiti Kebangsaan, Bangi, Selangor, Malaysia.

Results

Refer to the tree in Sharkey and Clutts (2010) for generic level placement. The host lepidopterans of the genus are unknown. The neighbor joining branching diagram in Figure 2, based on COI mtDNA, was used to help in determining species limits although we did not devise any cutoff threshold to delimit species. We conducted Bayesian and parsimony analyses and where these agreed with the NJ tree the support values are given in Figure 2. An examination of this figure shows that the NJ diagram

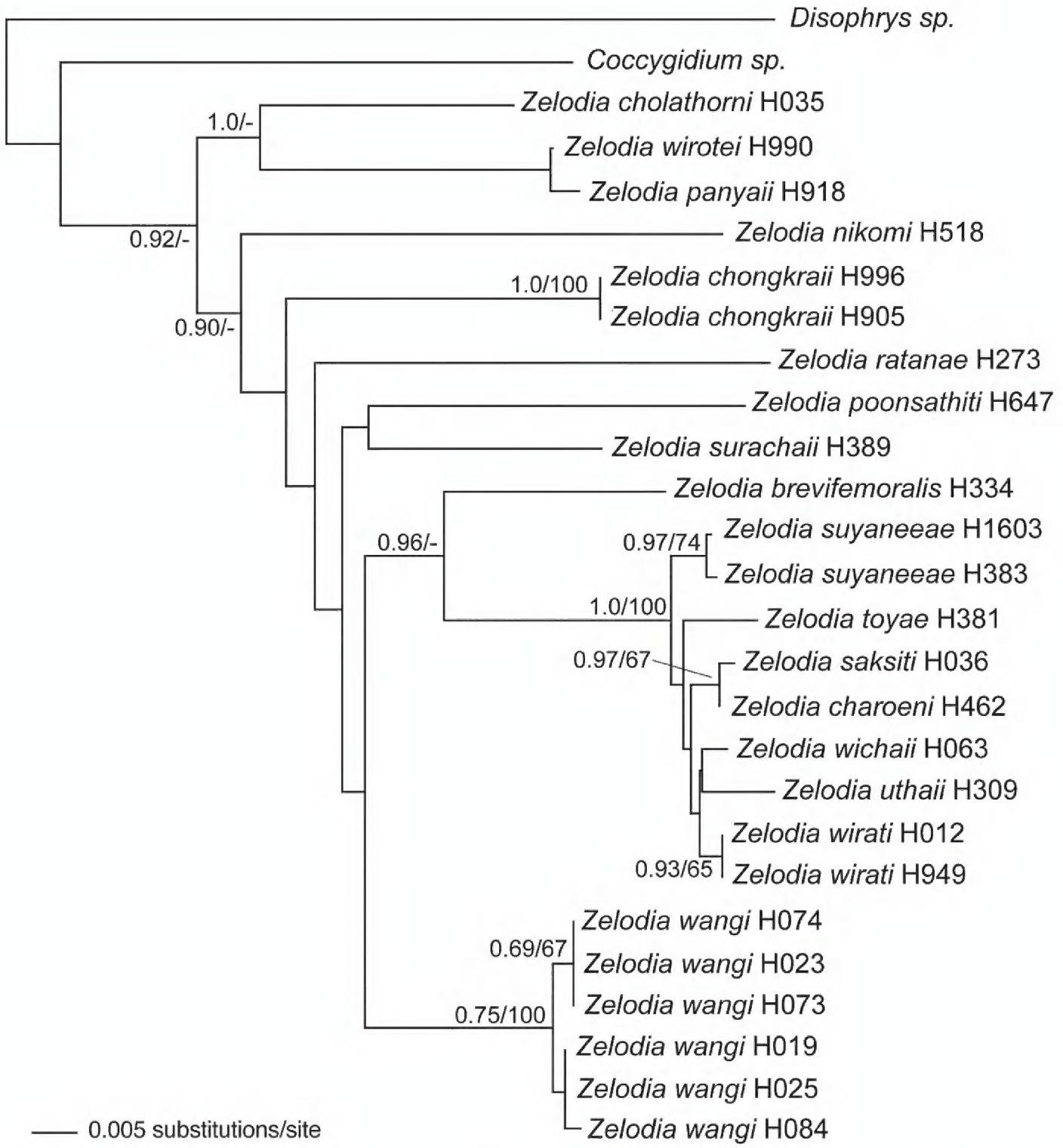


Figure 2. NJ phylogram of the COI barcode region for 17 of the 21 *Zelodia* species treated here. Wherever Bayesian and parsimony analyses agreed with the NJ tree branch support values are included in the figure i.e., Bayesian posterior probabilities / parsimony bootstrap (bootstrap values less than 60 are not illustrated).

and the phylogenetic analyses were in close agreement. We also used morphological differences to delimit species. For example, *Z. saksiti* and *Z. charoeni* are very similar (1/558 bp difference) in COI sequences but are very different morphologically. Contrastingly, *Zelodia wangi* is a widespread species and COI sequences show some variation (2/558 bp difference), however we could find no morphological differences. The complex may represent several species.

Taxonomy

Diagnosis

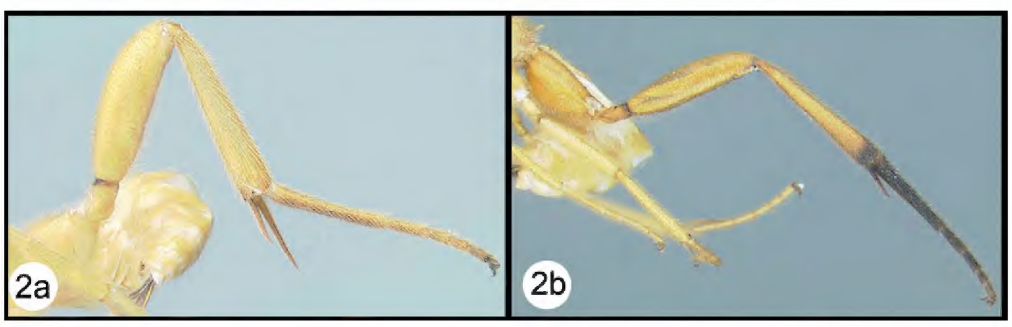
Members of *Zelodia* may be distinguished from all other Agathidinae with the following combination of characters: ovipositor short, shorter than length of metasoma; tarsal claws cleft; hind trochantellus with 2 longitudinal carinae; frons lacking lateral carinae between antennae and lateral ocelli.

Key to Thai species of *Zelodia*

(Note: there are often more than 2 alternatives in each couplet)

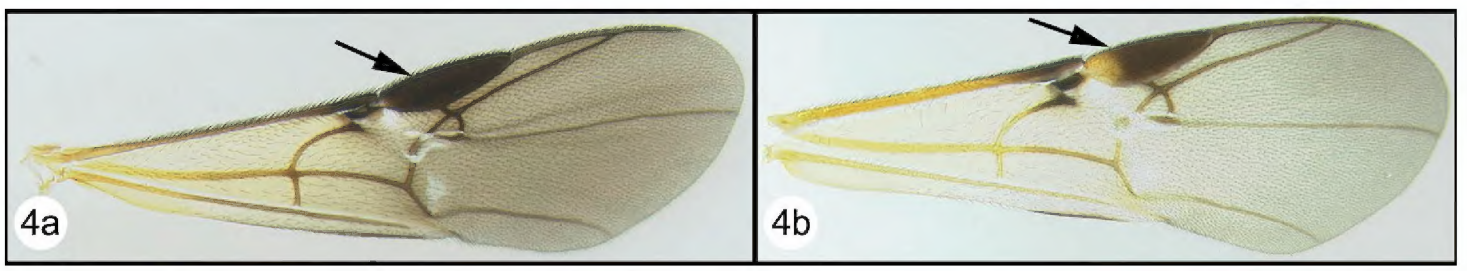
1 a. Hind femur all pale **2**
b. Hind femur all melanic 7
c. Hind femur melanic dorsally and ventrally, orange laterally and medially . ..... ***Z. ratanae*** **Sharkey sp.n.**

2(1) a. Hind leg including tarsus entirely pale .... ***Z. brevifemoralis*** **Achterberg & Long**
b. Hind leg melanic and pale, often mostly pale with tarsus melanic **3**

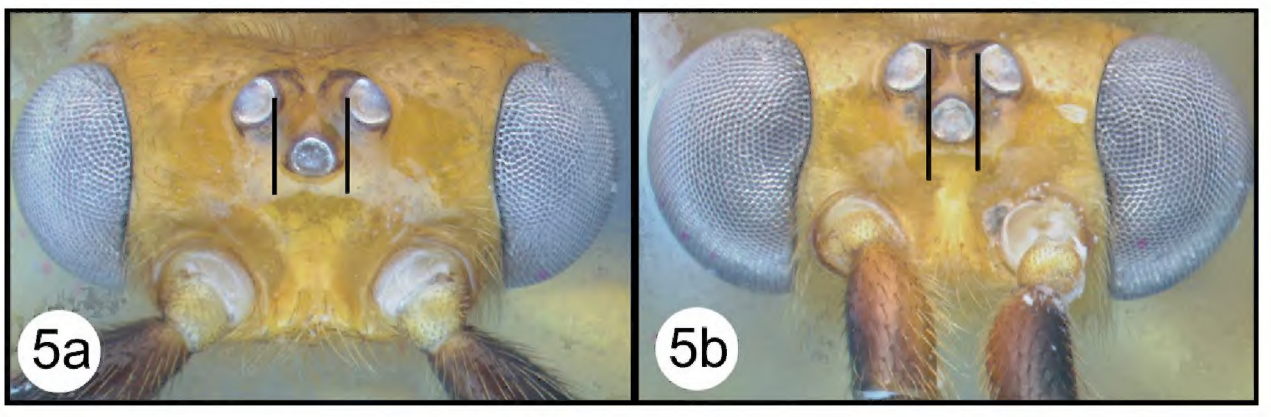


3(2) a. Mesoscutum entirely pale.....**4**
b. Mesoscutum mostly melanic except margins pale ... ***Z. idrisi*** **Sharkey sp.n.**

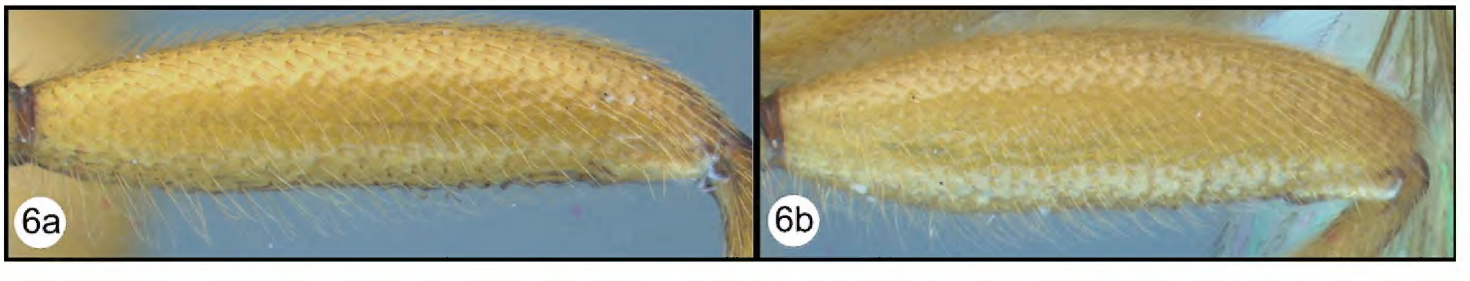
4(3) a. Stigma entirely melanic.....***Z. nikomi*** **Sharkey sp.n.**
b. Stigma partly or entirely yellow.....**5**



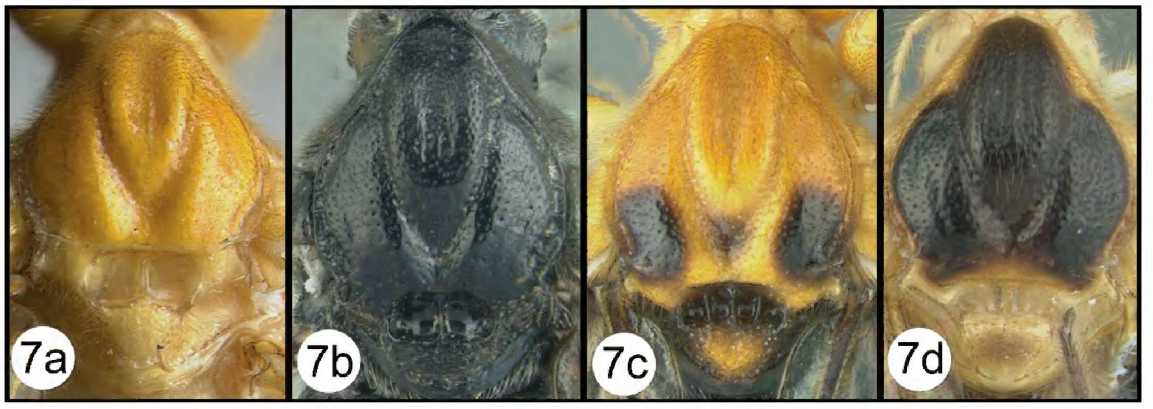
5(4) a. Median ocellus distinctly narrower than space between lateral ocelli **6**
b. Median ocellus about as widen as space between lateral ocelli .....
.....***Z. toyae*** **Sharkey sp.n.**



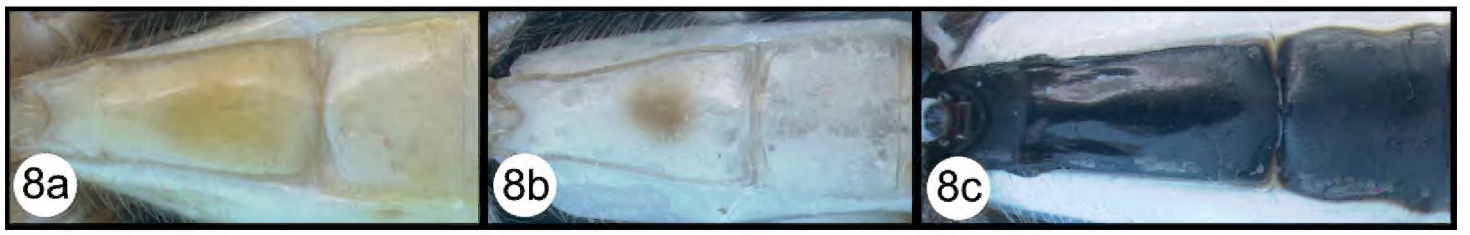
6(5) a. Hind femur more than 4× longer than wide (average 4.2×).....
.....***Z. suyaneeae*** **Sharkey sp.n.**
b. Hind femur less than 4× longer than wide (average 3.5×) .....
.....***Z. wichaii*** **Sharkey sp.n.**



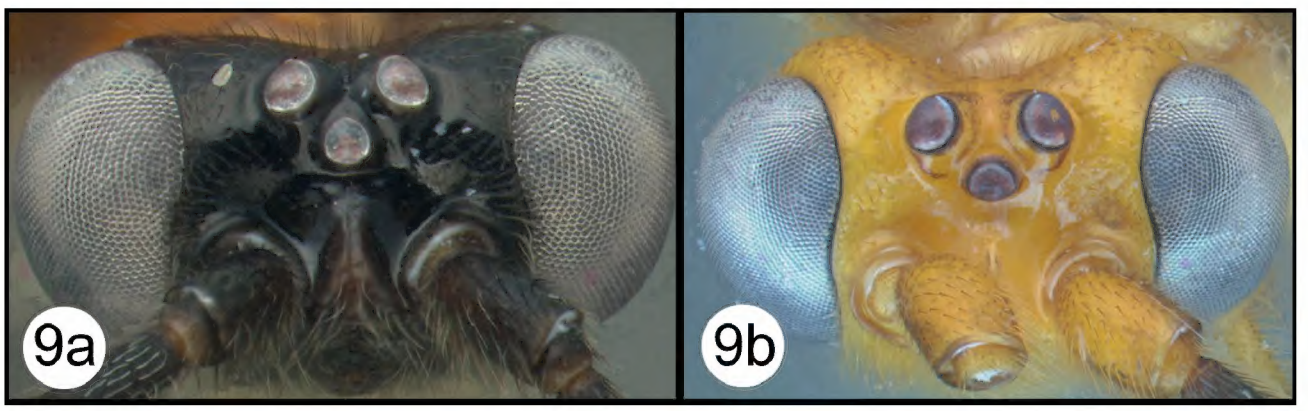
7(1) a. Mesoscutum entirely pale **8**
b. Mesoscutum entirely melanic **10**
c. Mesoscutum mostly pale with melanic spots posteriorly.....
..... ***Z. chongkraii*** **Sharkey sp.n.**
d. Mesoscutum mostly melanic except on margins pale **12**



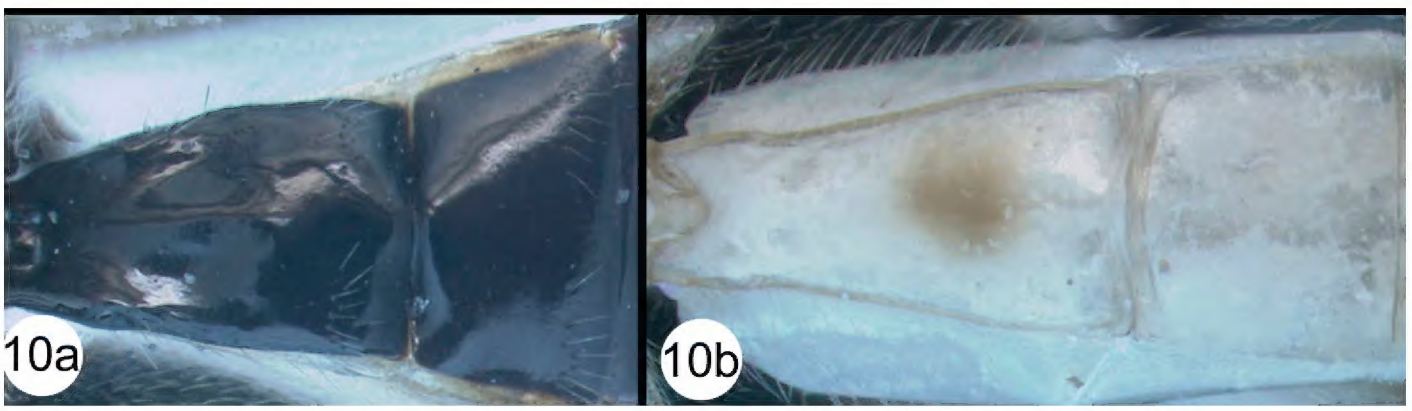
8(7) a. Median tergite 1 mostly yellow **15**
b. Median tergite 1 all white or cream colored, sometimes with a bit of melanic color subapically ..... ***Z. wirotei*** **Sharkey sp.n.**
c. Median tergite 1 all black **9**



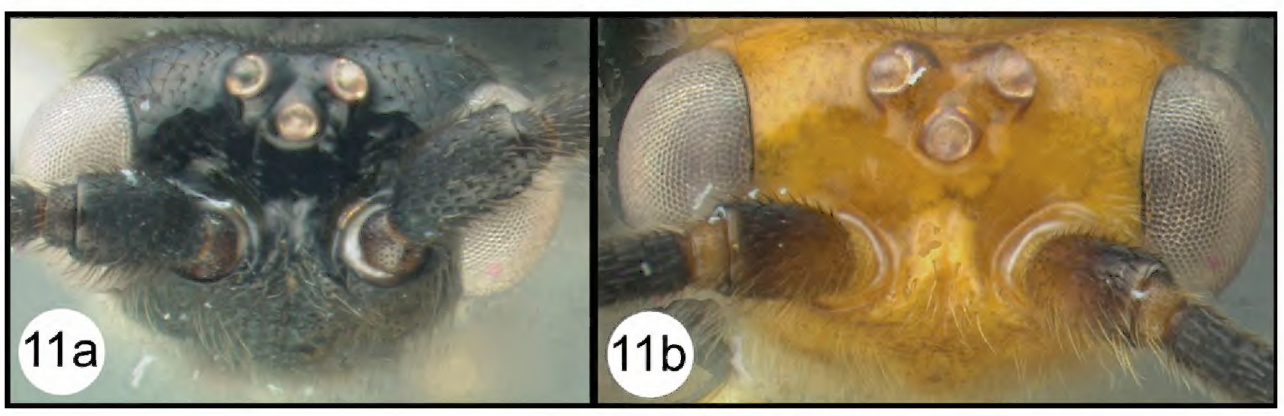
9(8) a. Head (not including mouthparts or antenna) mostly or entirely pale .....
..... ***Z. longidorsata*** **(Bhat & Gupta)**
b. Head (not including mouthparts or antenna) mostly or entirely melanic..
..... ***Z. panyaii*** **Sharkey sp.n.**



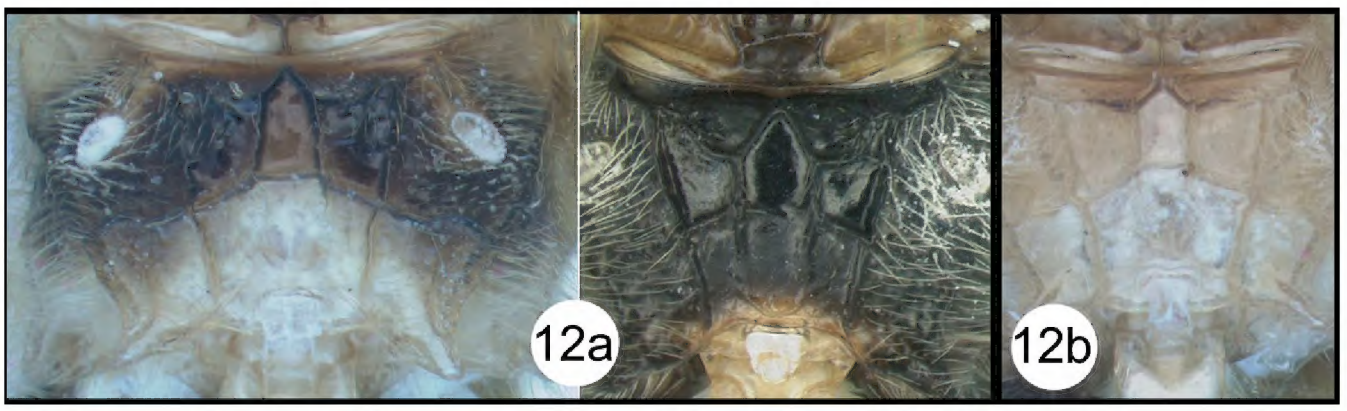
10(7) a. Median tergite 1 all black ..... ***Z. cholathorni*** **Sharkey sp.n.**
b. Median tergite 1 all white or cream colored or sometimes with a bit of melanic color subapically **11**



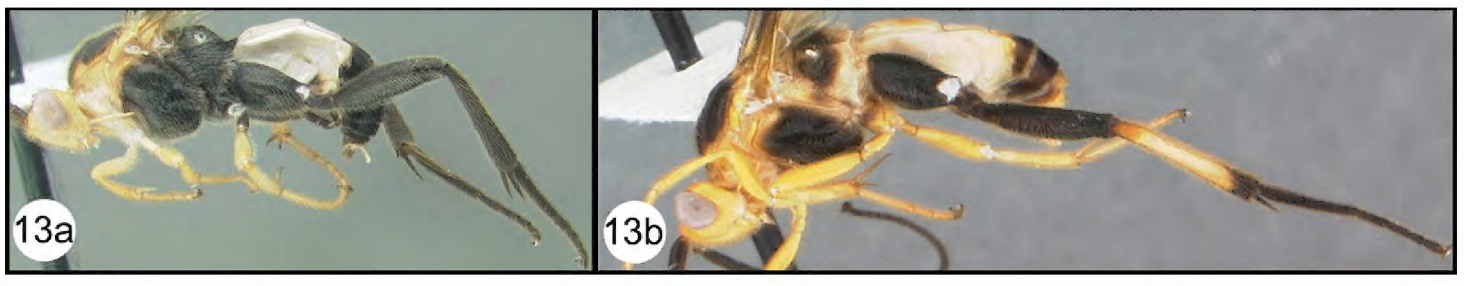
11(10) a. Head (not including mouthparts or antenna) mostly or entirely melanic... ..... ***Z. surachaii*** **Sharkey sp.n.**
b. Head (not including mouthparts or antenna) mostly or entirely pale .... ***Z. nopadoli*** **Sharkey sp.n.**



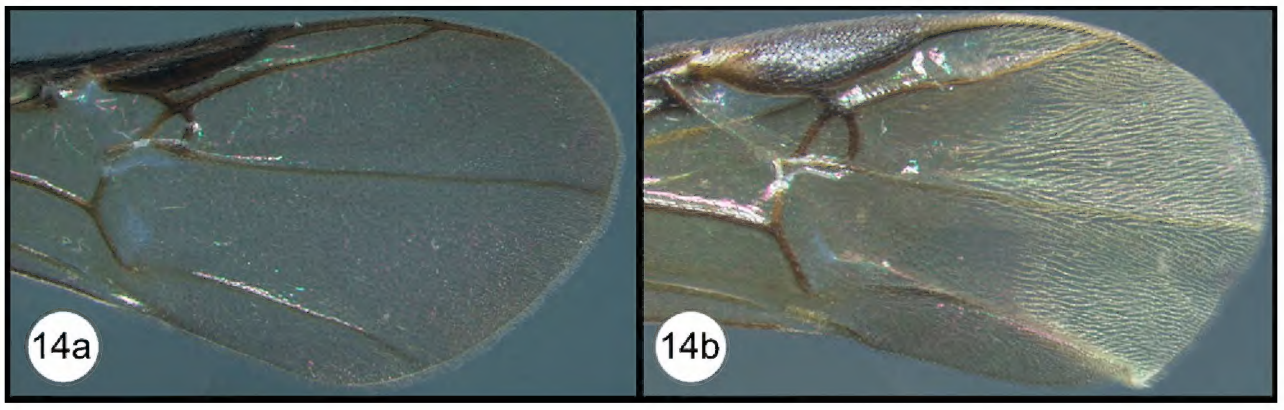
12(7) a. Propodeum melanic in anterior half or more **13**
b. Propodeum entirely pale **14**



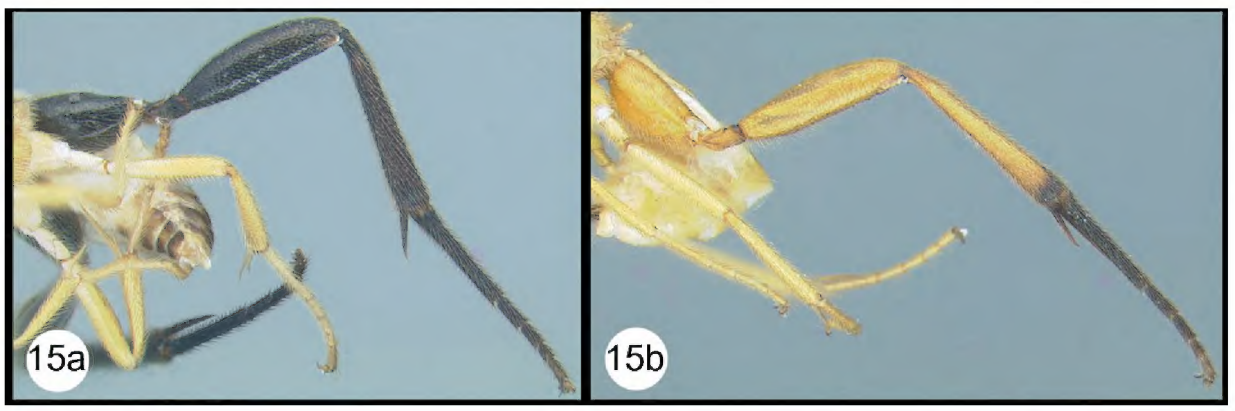
13(12) a. Hind leg entirely melanic ..... ***Z. poonsathii*** **Sharkey sp.n.**
b. Hind leg melanic except tibia mostly pale ..... ***Z. saksiti*** **Sharkey sp.n.**



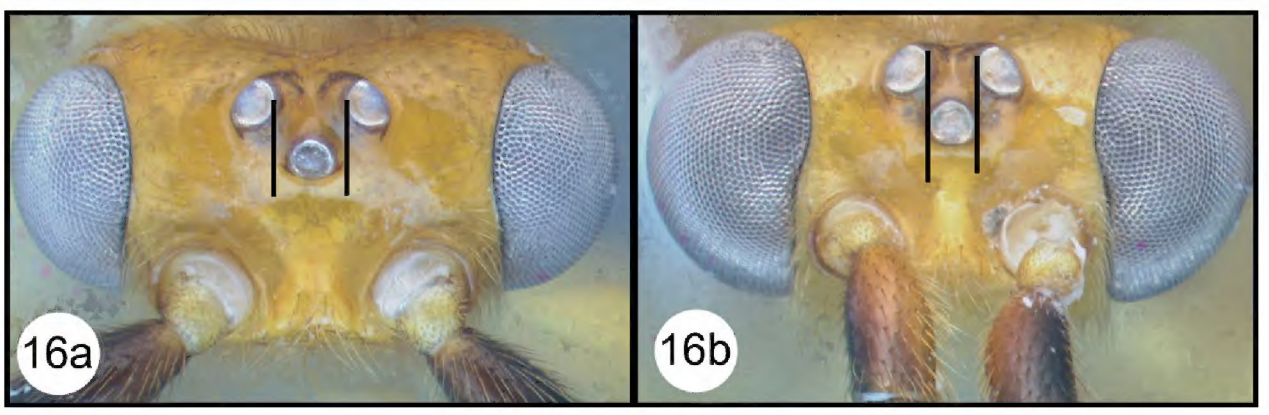
14(12) a. Fore wing not lighter apically than subapically, lacking white setae apically ..... ***Z. uthaii*** **Sharkey sp.n.**
b. Fore wing lighter apically than subapically, with extensive white setae apically ..... ***Z. pahangensis*** **Sharkey sp.n.**



15(8) a. Hind tibia entirely melanic..... ***Z. wangi*** **Sharkey sp.n.**
b. Hind tibia mostly pale **16**



16(15) a. Median ocellus distinctly narrower than space between lateral ocelli..... ..... ***Z. charoeni*** **Sharkey sp.n.**
b. Median ocellus about as wide as space between lateral ocelli .... ***Z. wirati*** **Sharkey sp.n.**



Species Treatments

Zelodia brevifemoralis Achterberg & Long

http://species-id.net/wiki/Zelodia_brevifemoralis

Fig. 3

Zelodia brevifemoralis Achterberg and Long, 2010 [Holotype ♀ (RMNH) examined]

Diagnosis. Hind leg, including tarsus (except apical tarsomere), entirely pale.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H334/ATRMK197-11/JQ763436.

Distribution. Recorded from Vietnam and central Thailand. Distribution map of the sole Thai locality can be found at http://purl.org/thaimap/brevifemoralis

Material examined. H0334 [QSBG] ♀, Thailand, Phu Kradueng NP, 420, 16.844°N, 101.692°E, MT, 1–7.vii.2008.

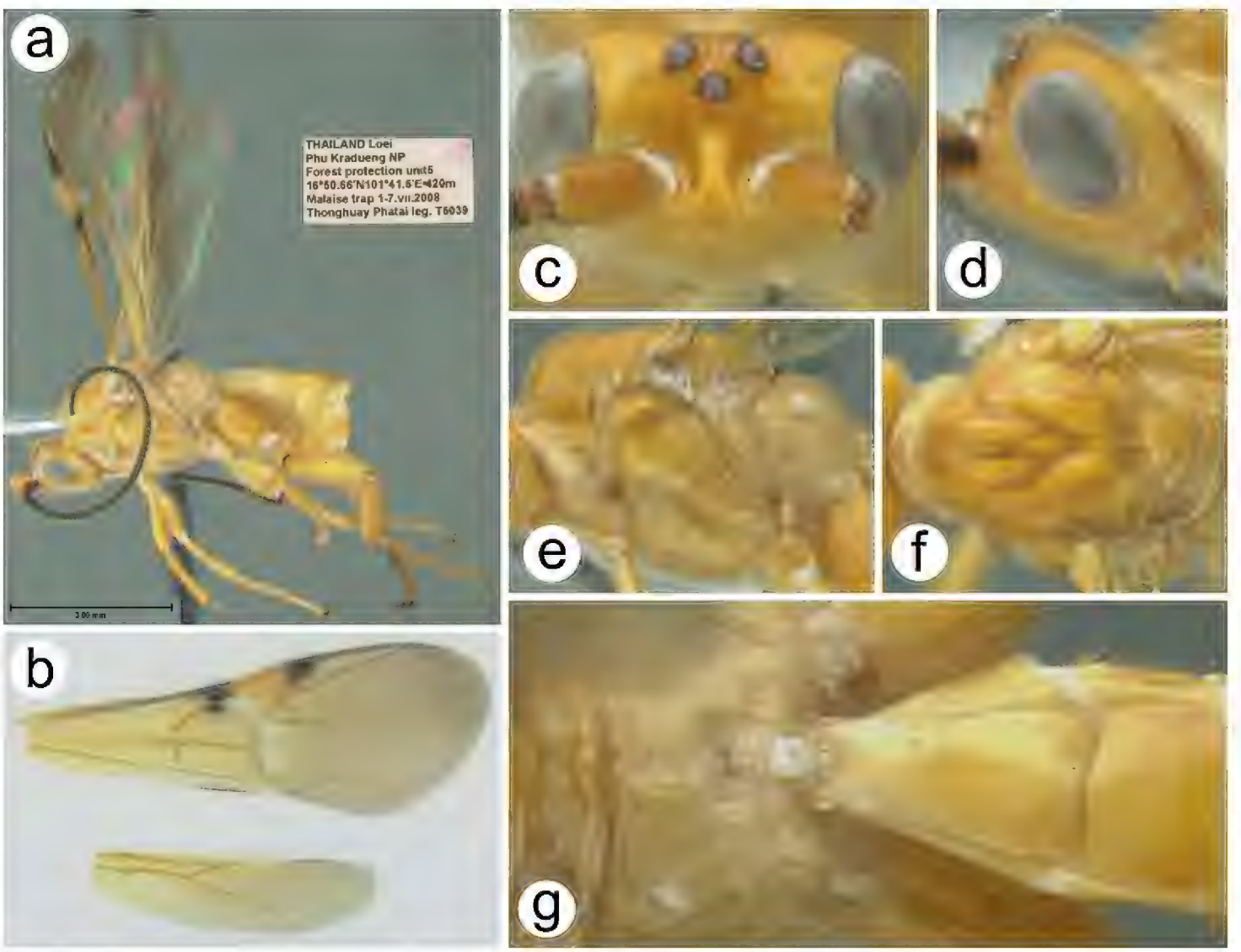


Figure 3. *Zelodia brevifemoralis* Achterberg and Long **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1–MT2.

***Zelodia charoeni* Sharkey sp.n.**
urn:lsid:zoobank.org:act:85D50740-7E31-4F89-AB31-B8689CC225CF
http://species-id.net/wiki/Zelodia_charoeni
Fig. 4

Diagnosis. Hind tibia pale except apex black; hind femur melanic; mesoscutum pale; median ocellus distinctly narrower than space between lateral ocelli.

Description. Body length 7.4 mm (7.2–7.4). **Head.** 41 (39–41) flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly infuscate apically, veins yellow basally except costa mostly melanic, melanic apically and around parastigma, stigma yellow in basal fifth. Hind tarsal claw bifid. Length/width of hind femur 2.22/0.552 = 3.9 (3.9–4.1). Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.257/0.539 = 2.3. Ratio of widest point of MT1 to narrowest point 0.539/0.35 = 1.5 (1.4–1.5). **Color.** Mostly yellow; black as follows: antenna except scape brown medially, hind leg except basal 4/5 of tibia yellow. Median area of mesopleuron yellow (to mostly brown).

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H462/ATRMK214-11/JQ763437.

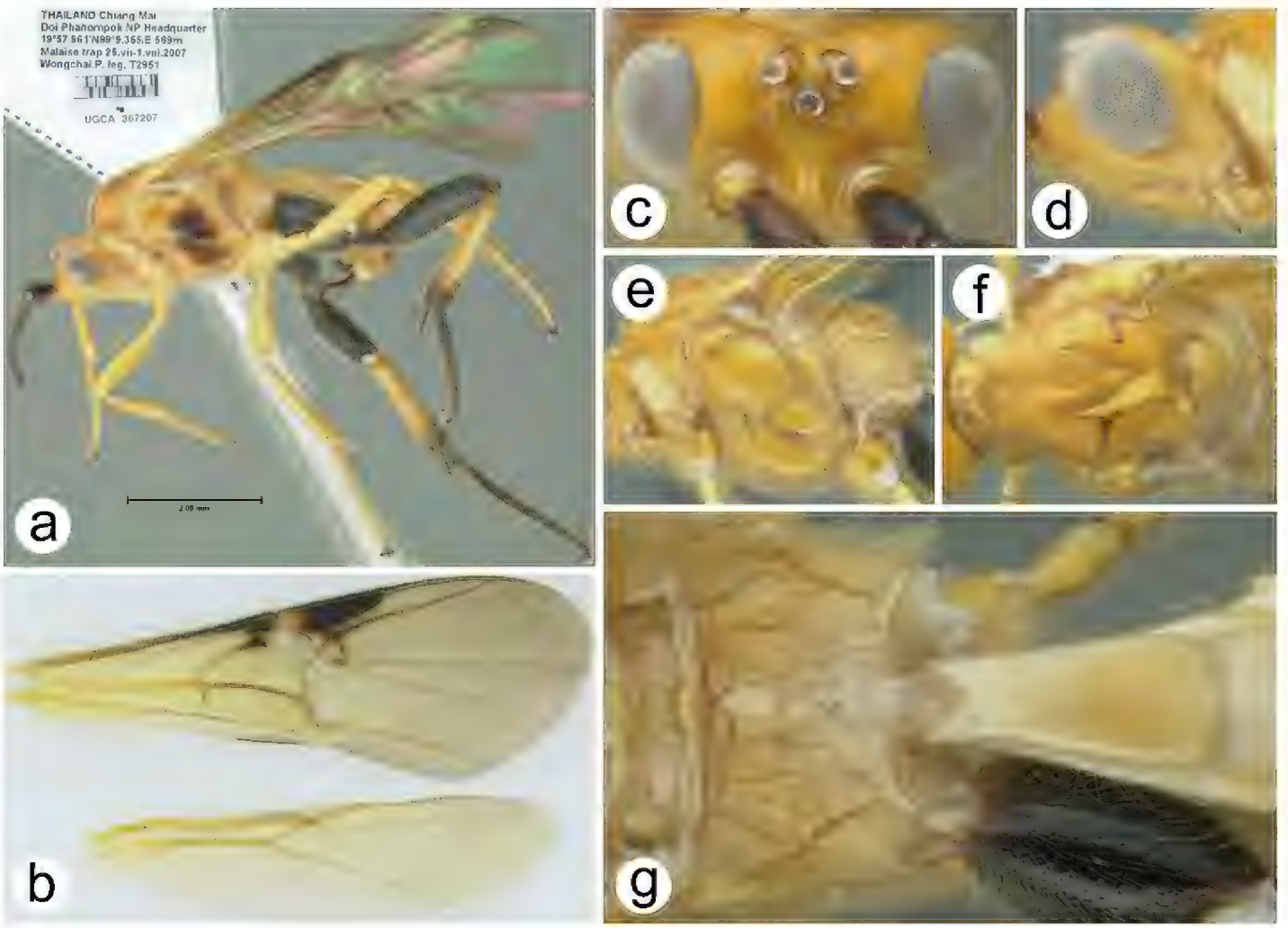


Figure 4. *Zelodia charoeni* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1.

Distribution. Found only in northern Thailand. Distribution map can be found at http://purl.org/thaimap/charoeni

Etymology. Dedicated to Mr. Charoen Wanna, collector at Doi Phuka National Park.

Material examined. Holotype ♀. H5905 [QSBG], Thailand, Doi Phahompok NP Headquarters, 569, 19.966°N, 99.156°E, MT, 25.vii–1.viii.2007.

Paratypes. Thailand: ♀, Nam Nao NP, Check point, 921m, 16.728°N, 101.563°E, MT, 28.iv–5.v.2007: H0461 [HIC]; ♂, Doi Phahompak Office, 569m, 20.191°N, 99.248°E , MT, 28.v–7.vi.2008: H0462 [QSBG].

***Zelodia cholathorni* Sharkey sp.n.**
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http://species-id.net/wiki/Zelodia_cholathorni
Fig. 5

Diagnosis. Mesoscutum entirely melanic; hind tibia all melanic; head melanic; MT1 black.

Description. Body length 6.0 mm. **Head.** 38 flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex densely and heavily punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron densely covered with setae. Fore wing cells weakly infuscate, more so apically, veins brown to black. Hind

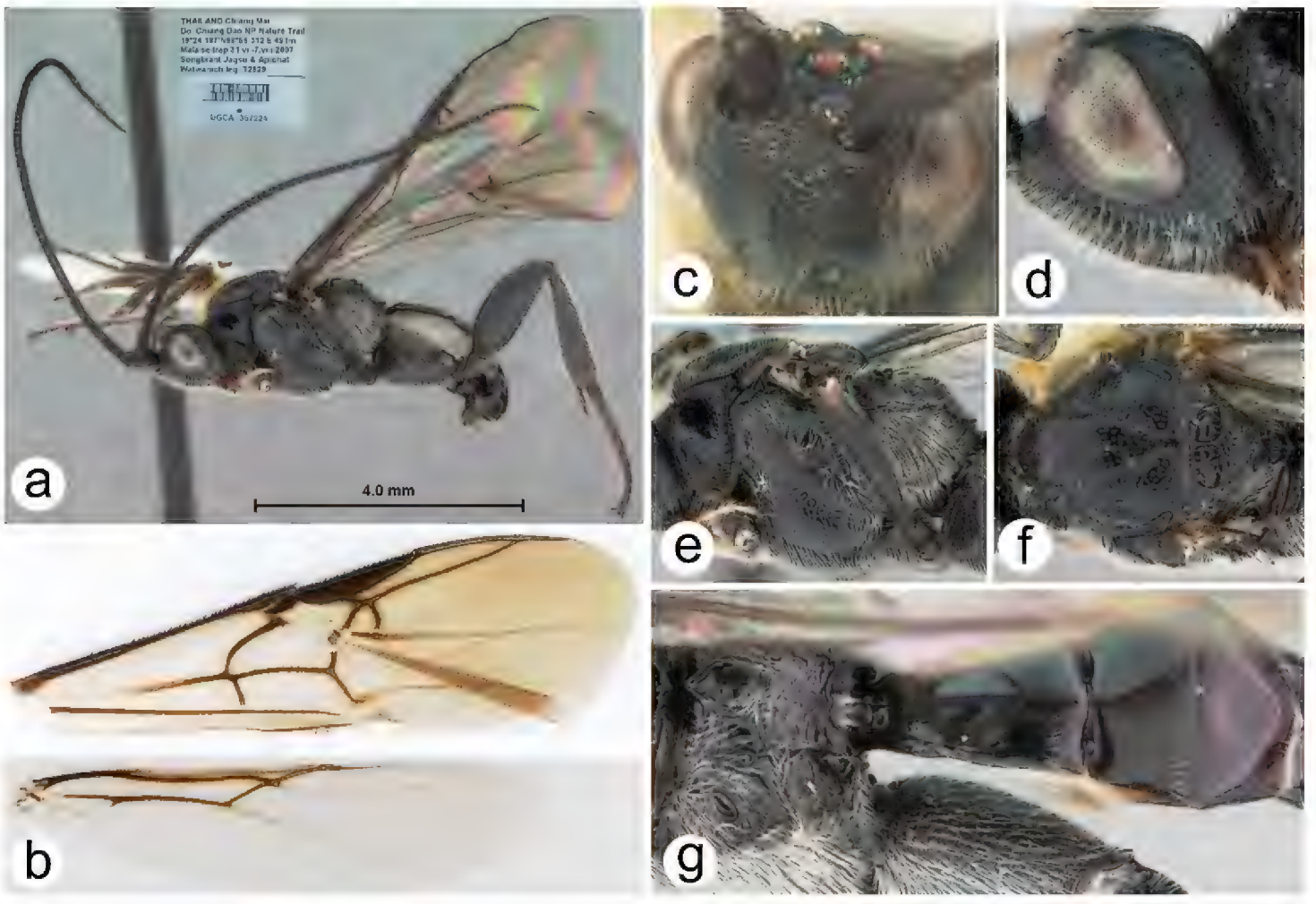

Figure 5. *Zelodia cholathorni* sp.n. **a** lateral habitus **b** wings **c** anterodorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1–MT3.

tarsal claw with elongate basal tooth. Length/width of hind femur 1.8/0.7 = 2.7. Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 0.91/0.659 = 1.37. Ratio of widest point of MT1 to narrowest point 0.7/0.4 = 1.5. **Color.** Black except palpi mostly yellow and metasomal laterotergites and S1–S3.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H035/ATRMK141-09/JQ763438.

Distribution. Found only at the type locality in northern Thailand. Distribution map can be found at http://purl.org/thaimaps/cholathorni

Etymology. Dedicated to Mr. Cholathorn Chamnanthip, chief of Doi Phahompok National Park, one of our collecting sites.

Material examined. Holotype ♂. H0035 [QSBG], Thailand, Doi Chiang Dao WS, Nature Trail, 491m, 19.403°N, 98.922°E, MT, 31.vii–7.viii.2007.

Paratypes. ♂ Thailand, Doi Chiangdao NP, Headquarters, 491m, 19.405°N, 98.922°E, MT, 21–28.viii.2007: H4597 [QSGB], H4593 [HIC].

***Zelodia chongkraii* Sharkey sp.n.**

urn:lsid:zoobank.org:act:9D77F05D-907C-4643-AD41-FFA1E12A74C9

http://species-id.net/wiki/Zelodia_chongkraii

Fig. 6

Diagnosis. Mesoscutum mostly pale with melanic spots posteriorly.

Description. Body length 7.3 mm (7.1–7.3). **Head.** 41 (40–41) flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells all weakly infuscate, more so apically, veins melanic. Hind tarsal claw bifid. Length/width of hind femur 2.169/0.506 = 4.3. Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.258/0.458 = 2.3 (2.2–2.3). Ratio of widest point of MT1 to narrowest point 0.543/0.405 = 1.3 (1.3–1.4). **Color.** Yellow, black, and white; metasomal segments 1 and 2, LT3 and S3 all white; yellow as follows: head except antenna, prothorax, most of mesoscutum and scutellar disc, fore leg, mid leg except coxa, trochanter, trochantellus, and base of femur partly melanic; remaining body parts black.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H905/ATRMK260-11/JQ763439; H996/ATRMK273-11/JQ763440.

Distribution. Eastern and northeastern Thailand. Distribution map can be found at http://purl.org/thaimap/chongkraii

Etymology. Dedicated to Mr. Chongkrai Worapongthorn, chief of Doi Inthanon National Park, one of our collecting sites.

Material examined. Holotype ♀. H0996 [QSBG], Thailand, Huai Nam Dang NP, Thung Buatong, 19.293°N, 98.6°E, MT, 21–28.iv.2008.

Paratype. ♀, Thailand, Kaeng Krachan NP, Panernthung/km27, 950m, 12.8217°N, 99.371°E, MT, 8–15.vi.2009, H0905 [HIC].

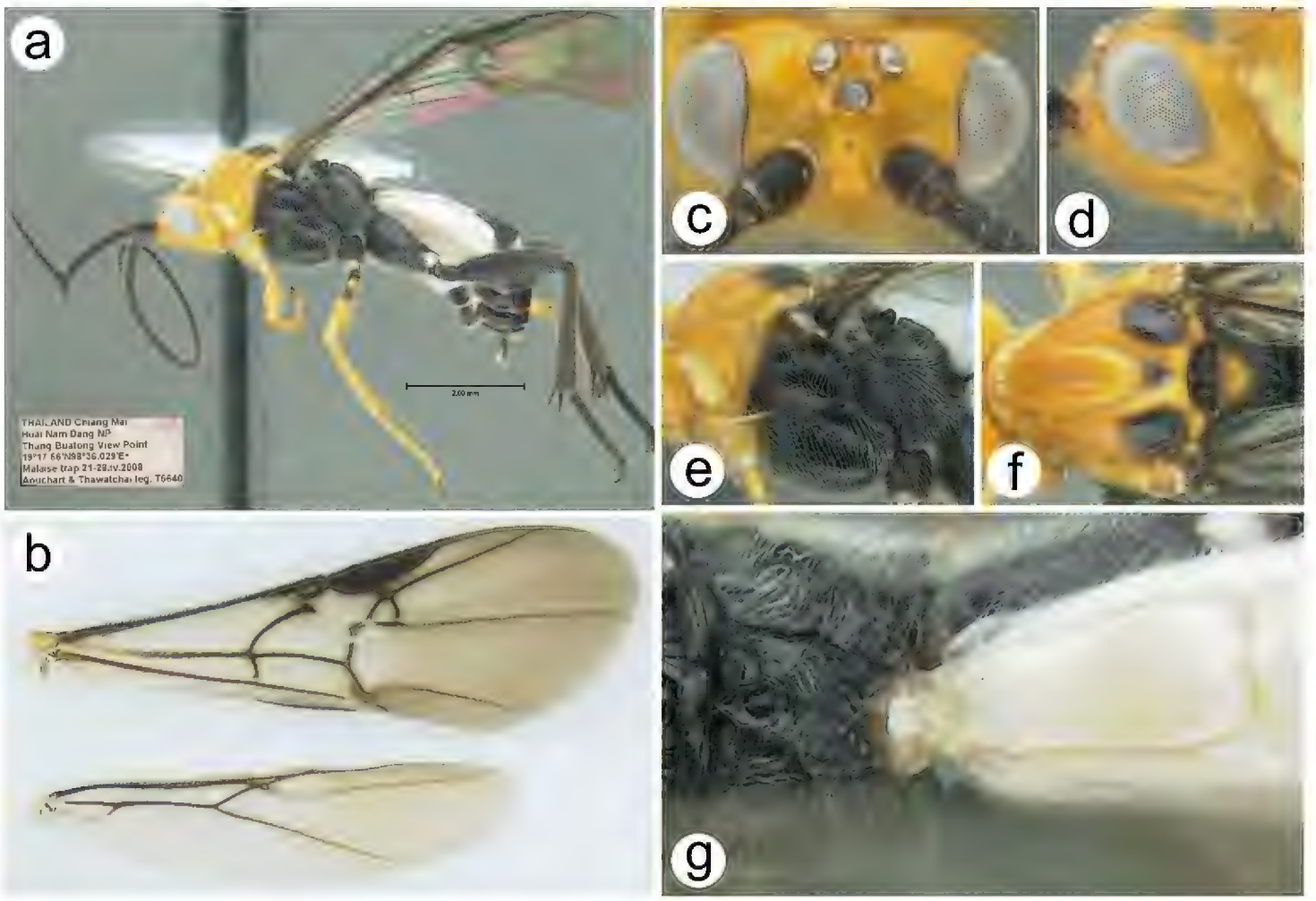

Figure 6. *Zelodia chongkraii* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1.

***Zelodia idrisi* Sharkey sp.n.**
urn:lsid:zoobank.org:act:F01DB087-985E-4475-8E3D-D0F50A398CB6
http://species-id.net/wiki/Zelodia_idrisi
Fig. 7

Diagnosis. Head melanic dorsally and posteriorly, pale ventrally and anteriorly; hind femur all pale.

Description. Body length 9.0 mm (7.6–9.0). **Head.** 43 (42–43) flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells yellowish basally, infuscate in distal 3rd fourth and clear in apical fourth with white setae, veins yellow basally and apically, brown at midlength, stigma yellow in basal fourth, otherwise dark brown. Hind tarsal claw bifid. Length/width of hind femur 2.63/0.75 = 3.5 (3.5–3.7). Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.60/0.82 = 2.0 (1.9–2.0). Ratio of widest point of MT1 to narrowest point 0.82/0.49 = 1.7 (1.5–1.7). **Color.** Mottled yellow, brown, orange, cream-colored, and black.

Distribution. Widespread in western Malaysia and likely present in southern Thailand. Distribution map can be found at http://purl.org/thaimap/idrisi

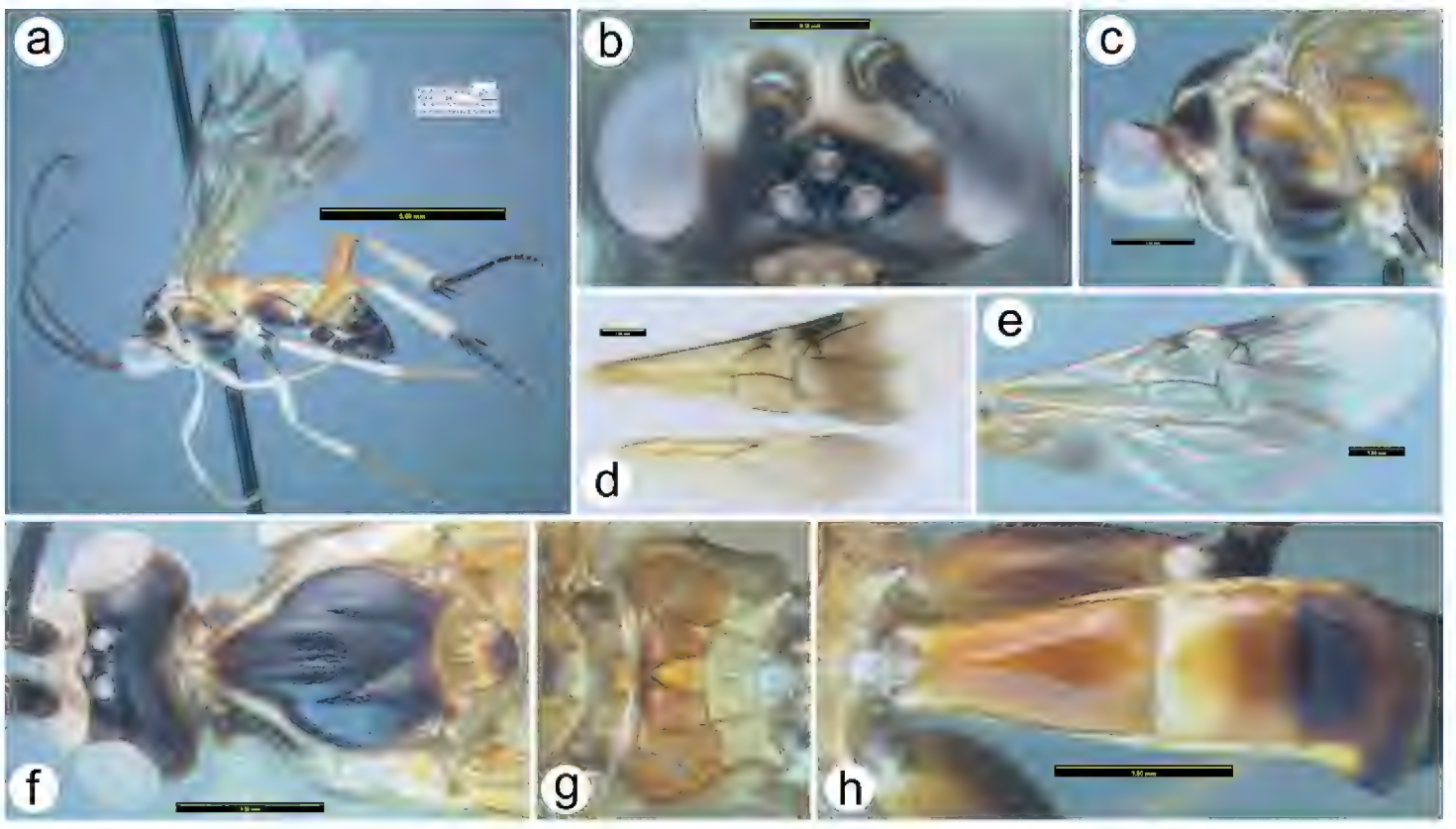

Figure 7. *Zelodia idrisi* sp.n. **a** lateral habitus **b** dorsal head **c** lateral head and mesosoma **d** wings with buffered light source **e** wings with normal light source **f** dorsal head and mesosoma **g** dorsal propodeum **h** dorsal MT1–MT3.

Etymology. Dedicated to Prof. Idris Abd. Ghani, professor at the School of Environmental and Natural Resource Science, Universiti Kebangsaan, Malaysia.

Material examined. Holotype ♀. H6733 [UKM], Malaysia, Kuala Lompat, Pahang, 3.695°N, 102.224°E, 3.iii.2009.

Paratypes. ♀, Malaysia: Kampung PETA, Johor, 2.541°N, 103.418°E, viii.2008: H8467 [QSBG]; Kuala Lompat, Pahang, 3.695°N, 102.224°E, 3.iii.2009:H8468 [QSBG]; Wang Kelian, Perlis, 6.678°N, 100.19°E, xi.2008: H8469 [HIC], H8466 [UKM]; Pasoh Forest Reserve, 23.x.2002: H8470 [HIC].

Zelodia longidorsata (Bhat & Gupta)

http://species-id.net/wiki/Zelodia_longidorsata

Fig. 8

Zelodia longidorsata (Bhat and Gupta) 1977 [Holotype, ♀ (CNC) examined]

Diagnosis. Hind tibia all melanic; mesoscutum entirely pale; stigma entirely melanic; head, except antenna, pale; propodeum mostly or entirely pale; median ocellus diameter equal to the space between lateral ocelli; MT1 long and narrow, not much wider apically than basally

Distribution. Recorded from southern India and a locality east of Bangkok, undoubtedly more widespread. Distribution map of Thai locality can be found at http://purl.org/thaimap/longidorsata

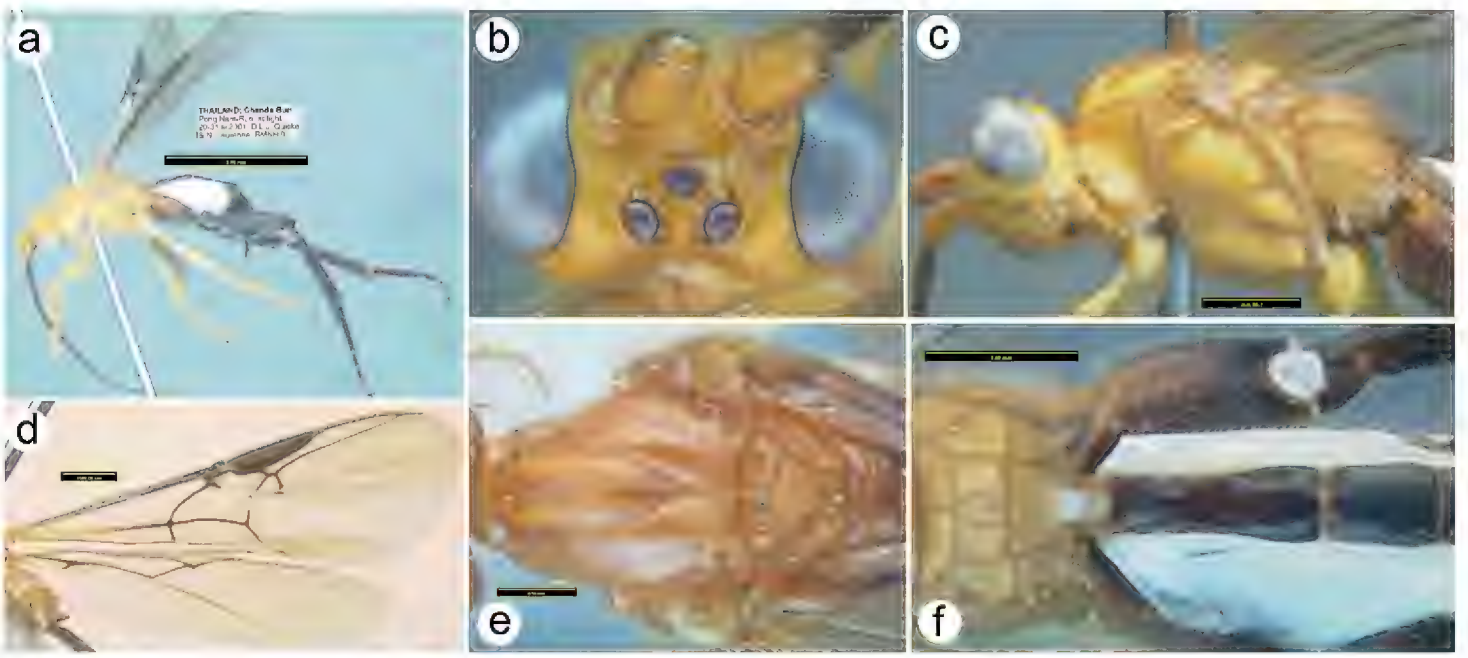

Figure 8. *Zelodia longidorsata* **a** lateral habitus **b** dorsal head **c** lateral head and mesosoma **d** wings **e** dorsal mesosoma **f** dorsal propodeum and metasomal terga 1 and 2.

Material examined. ♀, Thailand, Chanda Buri, Pong Nam Ron, 12.908°N, 102.262°E, MT, 20-31.iii.2001: H8471 [RMNH].

Zelodia nikomi Sharkey sp.n.

urn:lsid:zoobank.org:act:906199C7-511C-4D3E-A709-74059891E100
http://species-id.net/wiki/Zelodia_nikomi
Fig. 9

Diagnosis. Hind femur all pale; stigma entirely melanic; MT1 long and narrow, only slightly wider apically than basally.

Description. Body length 5.5 mm. **Head.** 35 flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells with a yellowish hue basally, infuscate apically, veins yellow basally, melanic apically, stigma entirely melanic. Hind tarsal claw bifid. Length/width of hind femur 1.83/5.0 = 3.7. Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 0.95/0.585 = 1.6. Ratio of widest point of MT1 to narrowest point 0.585/0.394 = 1.5. **Color.** Mostly yellow except as melanic as follows: flagellum, lateral surface of scape, hind tarsus, apex of hind tibia.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H518/ ATRMK220-11/JQ763441.

Distribution. Known only from the type locality in central Thailand. Distribution map can be found at http://purl.org/thaimap/nikomi

Etymology. Dedicated to Mr. Nikom Wongwan, collector at Phuka National Park.

Material examined. Holotype ♀. H0518 [QSBG], Thailand, Phu Kradueng NP, 420m, 16.844°N, 101.692°E, MT, 9–16.iii.2009.

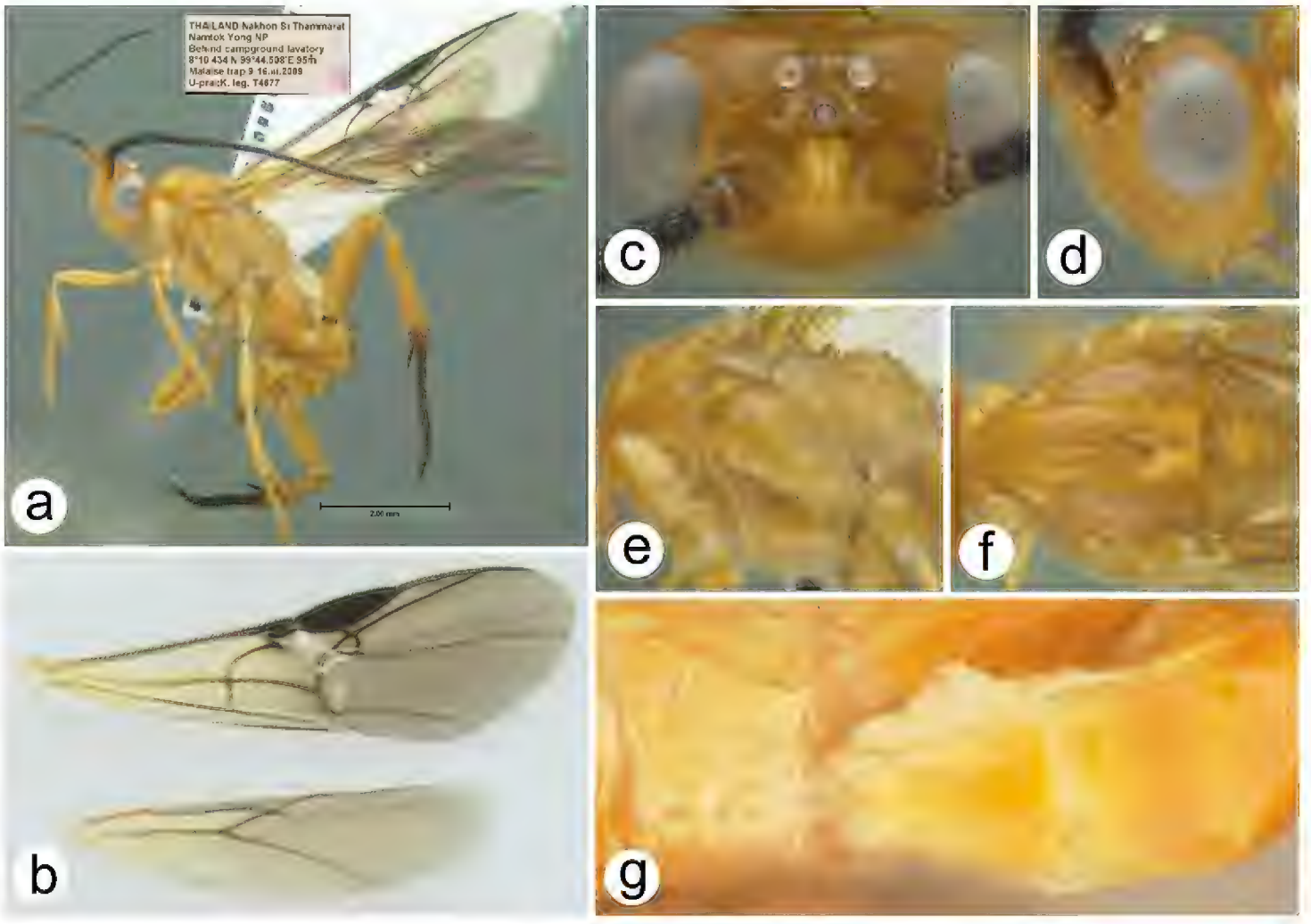

Figure 9. *Zelodia nikomi* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1-MT3.

***Zelodia nopadoli* Sharkey sp.n.**
urn:lsid:zoobank.org:act:CDC346AF-61D7-4CA3-88A6-33318DA2939E
http://species-id.net/wiki/Zelodia_nopadoli
Fig. 10

Diagnosis. Mesoscutum entirely melanic; head, except antenna, pale.

Description. Body length 7.7 mm (6.2–7.7). **Head.** (37–41) flagellomeres (both flagella broken in holotype). Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron with moderately dense setae. Fore wing cells hyaline basally, infuscate distally, veins including stigma melanic. Hind tarsal claw bifid. Length/width of hind femur 2.059/0.551 = 3.8 (3.5–4.8). Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.231/0.583 = 2.1 (2.1–2.3). Ratio of widest point of MT1 to narrowest point 0.583/0.376 = 1.6 (1.2–1.6). **Color.** Mostly black with yellow, white and cream color; head yellow, scape brown, flagellum black, prothorax yellow; fore leg and mid leg, except parts of coxa, yellow; MT1 and MT2 cream colored; basal laterotergites and sterna white; remainder of body black.

Distribution. Recorded from southeastern and northwestern Thailand. Distribution map can be found at http://purl.org/thaimap/nopadoli

Etymology. Dedicated to Mr. Nopadol Nachin, chief of Tad Tone National Park.

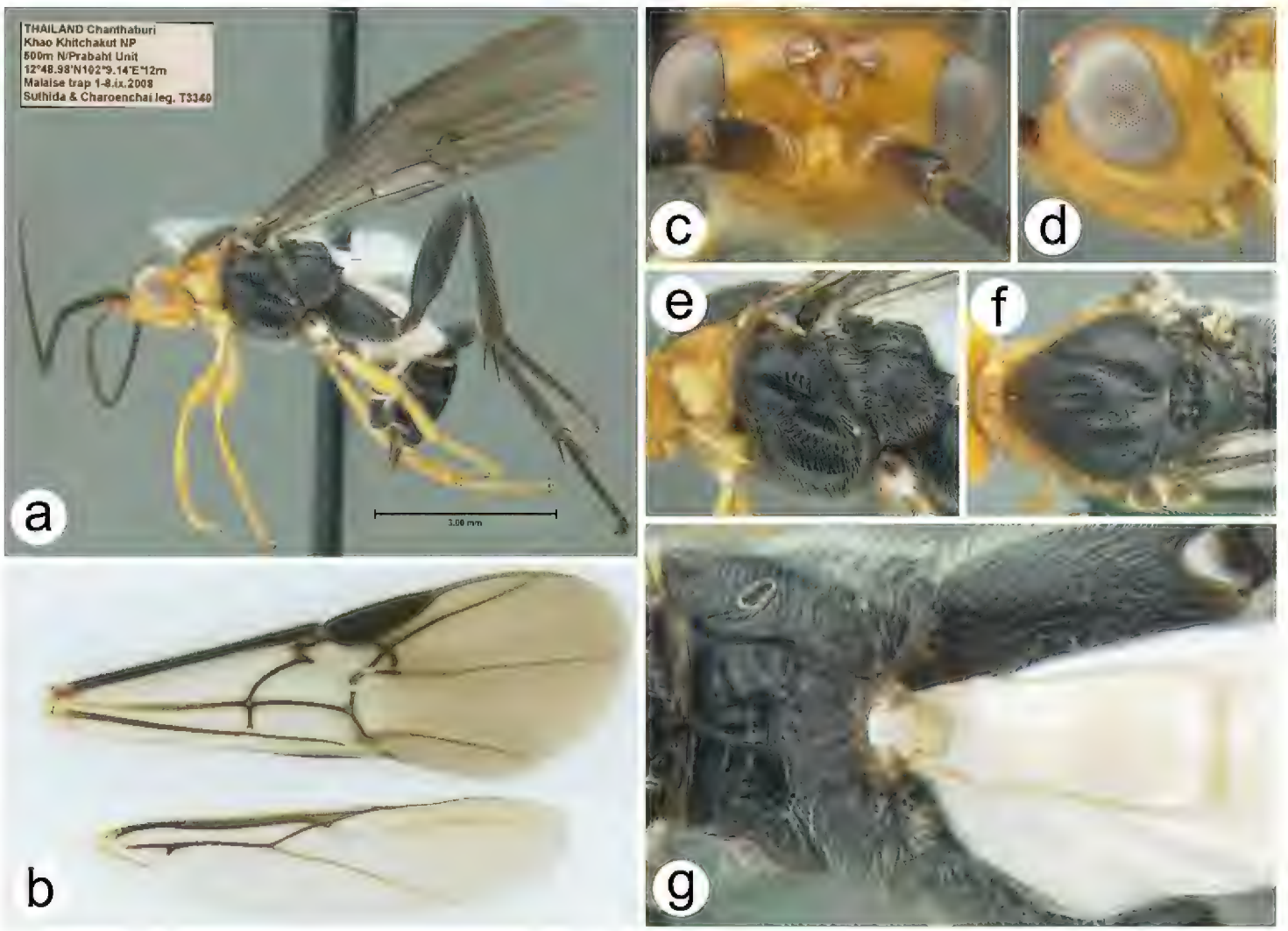

Figure 10. *Zelodia nopadoli* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1.

Material examined. Holotype ♀. H0323 [QSBG], Thailand, Khao Khitchakut NP, N/Prabaht Unit, 500m, 12.816°N, 102.152°E , MT, 1–8.ix.2008.

Paratypes. ♀, Thailand: Doi Inthanon NP, Chiang Mai, 1700m, 18.544°N, 98.525°E, MT, 3-12.v.1900: H8491[HIC]; Doi Chiangdao NP, Pha Tang substation, 526m, 19.416°N, 98.9147°E, MT, 28.viii–4.ix.2007: H0948 [QSBG].

***Zelodia pahangensis* Sharkey sp.n.**
urn:lsid:zoobank.org:act:C2307CCB-C04A-46EF-8244-B83DCD4899EE
http://species-id.net/wiki/Zelodia_pahangensis
Fig. 11

Diagnosis. Mesoscutum mostly melanic except margins pale; hind tibia mostly pale except apex and extreme base black; hind femur melanic; apex of fore wing hyaline with white setae.

Description. Body length 7.8 mm (7.4–7.8). **Head.** 39 (39–42) flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells weakly infuscate, veins mostly brown, lighter

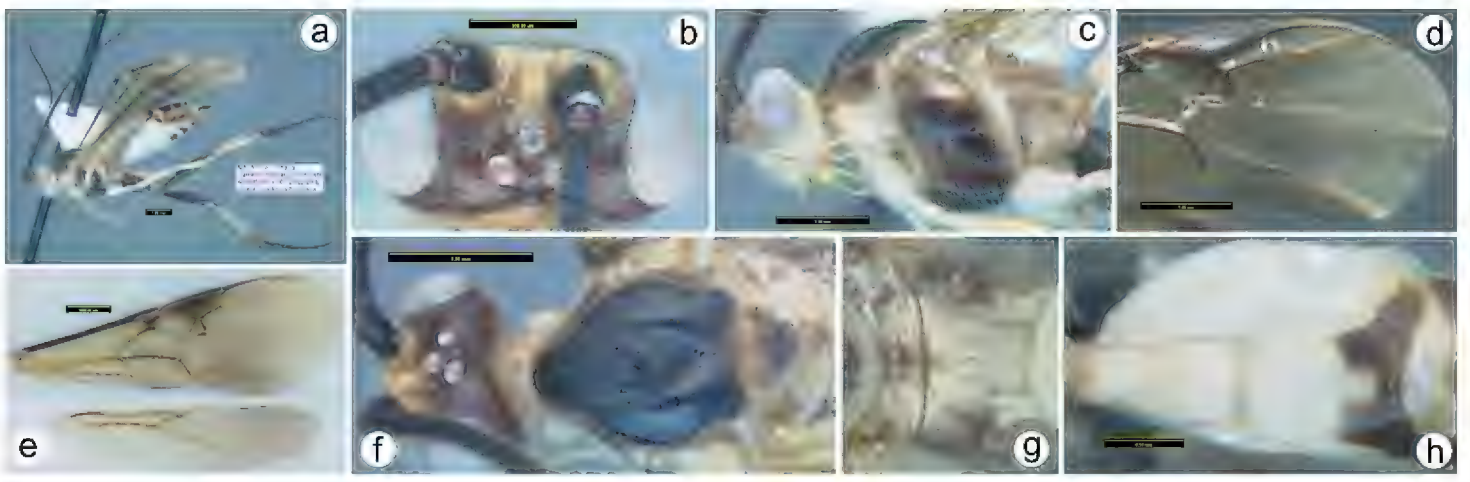

Figure 11. *Zelodia pahangensis* sp.n. **a** lateral habitus **b** dorsal head **c** lateral head and mesosoma **d** apex of fore wing **e** wings **f** dorsal head and mesosoma **g** dorsal propodeum **h** dorsal MT1–MT3.

basally and apically, stigma yellowish brown in basal 1/3, apex of wing with white setae, making it appear lighter. Hind tarsal claw bifid. Length/width of hind femur 2.32/0.5 = 4.6 (4.5–4.6). Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.3/0.59 = 2.2 (2.1–2.2). Ratio of widest point of MT1 to narrowest point 0.59/0.38 = 1.6 (1.5–1.6). **Color.** Mottled yellow, cream-colored and black; head yellow except vertex brown and antenna black, hind leg black except most of tibia pale.

Distribution. Known only from the type locality in western Malaysia but likely to be found in peninsular Thailand. Distribution map can be found at http://purl.org/thaimap/pahangensis

Etymology. The name is in reference to the Malaysian state, Pahang, in which the specimens were collected

Material examined. Holotype ♀, H8489 [UKM], Malaysia, Pahang, Cameron Highland, Parit Falls, 4.493°N, 101.389°E, MT, i.2009.

Paratypes. ♂ Malaysia, Pahang, Cameron Highland: Jasa, 4.493°N, 101.389°E, MT, 28.ii.2009: H8482 [HIC], H8484 [HIC], H8485 [QSBG], H8488 [UKM]; Parit Falls, 4.493°N, 101.389°E, MT, i.2009: H8486 [QSBG], H8487 [QSBG], H8483 [HIC], H8465 [UKM].

***Zelodia panyaii* Sharkey sp.n.**
urn:lsid:zoobank.org:act:CAE2FCB9-74C6-4B1B-B4A8-35216ACA9154
http://species-id.net/wiki/Zelodia_panyaii
Fig. 12

Diagnosis. Head (not including mouthparts) melanic; mesoscutum entirely pale.

Description. Body length 7.5 mm. **Head.** 39 flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron densely covered with setae. Fore wing cells weakly infuscate, more so apically, veins melanic. Hind tarsal claw bifid. Length/width of hind femur 2.117/0.539 = 3.9. Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.234/0.505 = 2.4. Ratio

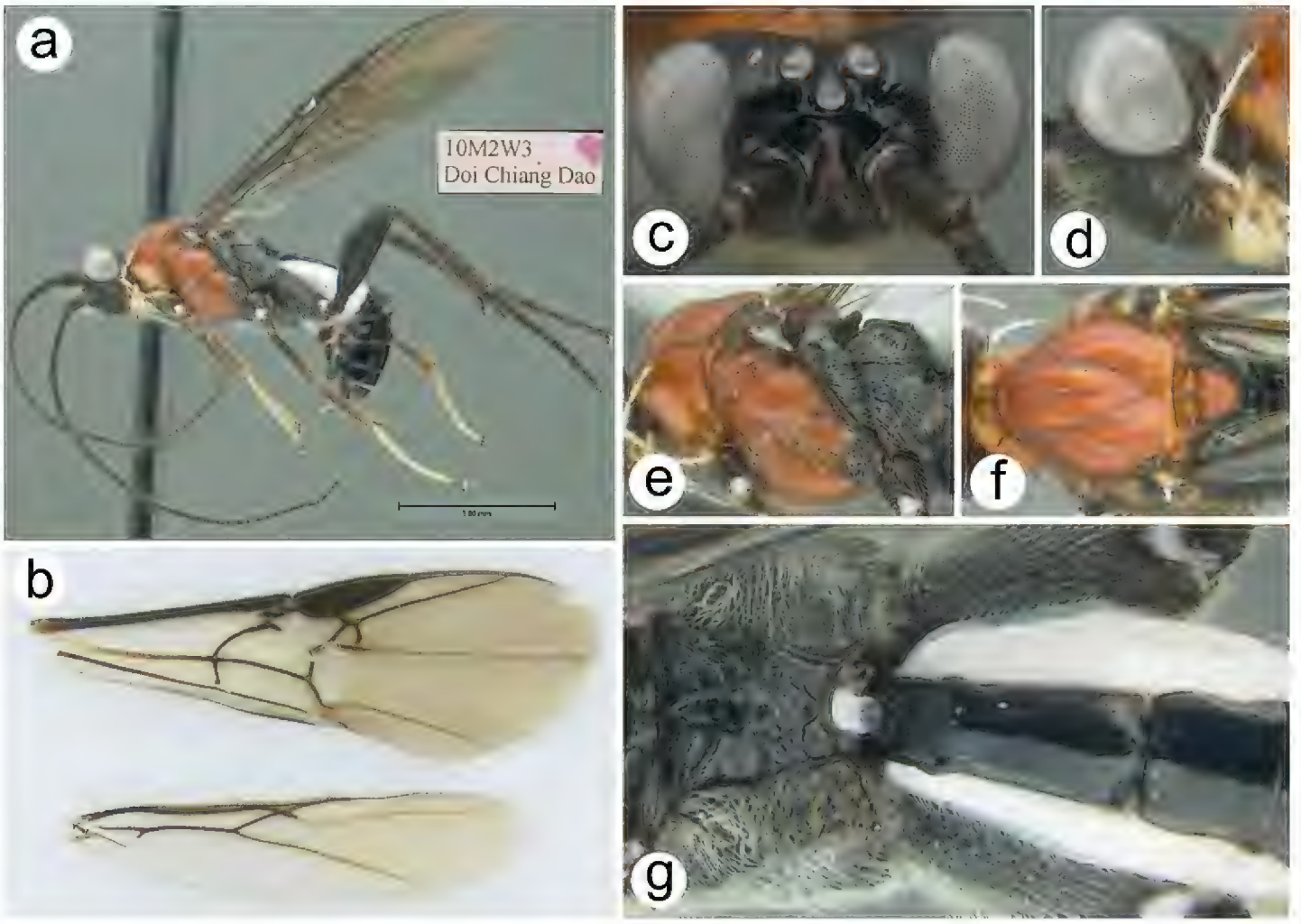

Figure 12. *Zelodia panyaii* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1 and MT2.

of widest point of MT1 to narrowest point 0.505/0.421 = 1.2. **Color.** Black, reddish orange, brown, cream colored and white: mostly black, reddish orange as follows: pro and mesothorax, most of fore leg; mid leg mostly brown; fore and mid tarsi yellow; mouthparts cream colored and yellow, anterior laterotergites and sterna white.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H918/ATRMK263-11/JQ763442.

Distribution. Known only from the type locality in northwestern Thailand. Distribution map can be found at http://purl.org/thaimap/panyaii

Etymology. Dedicated to Mr. Panya Kotesanlee, chief of Phuphan National Park.

Material examined. Holotype ♀ H0918 [QSBG], Thailand, Doi Chiangdao NP, Pha Tang substation, 19.416°N, 98.9147°E, MT, 15-21.v.2008.

***Zelodia poonsathiti* Sharkey sp.n.**
urn:lsid:zoobank.org:act:B98E3538-0386-430E-9681-50360DD1CD74
http://species-id.net/wiki/Zelodia_poonsathiti
Fig. 13

Diagnosis. Mesoscutum mostly melanic except margins pale; hind tibia all melanic.

Description. Body length. 7.2 mm. **Head.** 39 flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate.

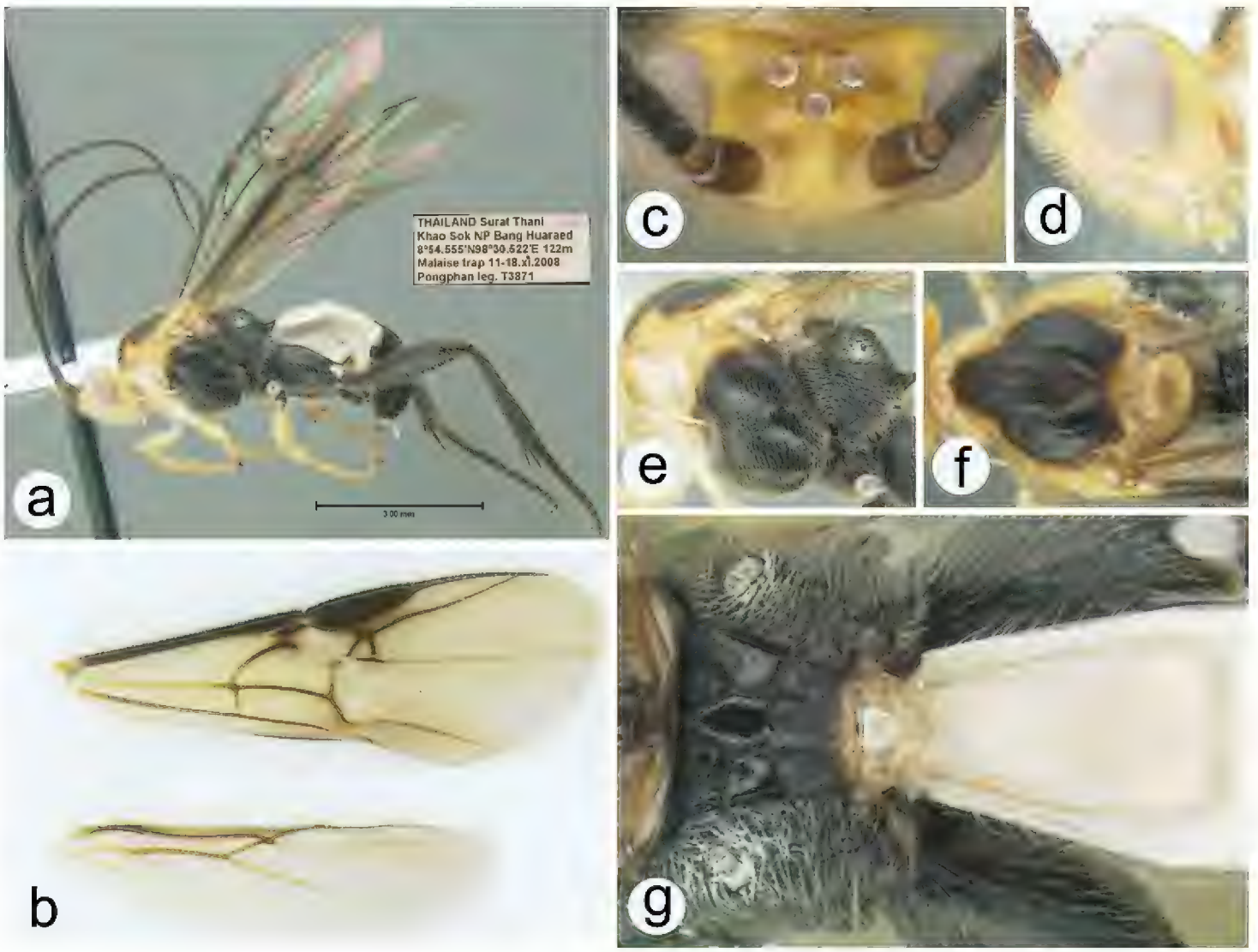

Figure 13. *Zelodia poonsathiti* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1.

Mesosoma. Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells weakly infuscate, veins mostly brown to black, M+Cu yellow. Hind tarsal claw bifid. Length/width of hind femur 2.059/0.586 = 3.5. **Metasoma.** Length/width ratio of MT1, 1.273/0.656 = 1.9. Ratio of widest point of MT1 to narrowest point 0.656/0.436 = 1.5. **Color.** Mottled yellow, cream-colored and black, head yellow except flagellum black and scape brown, hind leg black, MT1 and MT2 cream colored.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H647/ATRMK231-11/JQ763443.

Distribution. Found only at the type locality in southern peninsular Thailand. Distribution map can be found at http://purl.org/thaimap/poonsathiti

Etymology. Dedicated to Mr. Poonsathit Wongsawat, chief of Doi Phuka National Park.

Material examined. Holotype ♂ H0647 [QSBG], Thailand, Khao Sok NP, Bang Huaraed, 122m, 8.909°N, 98.509°E, MT, 11-18.xi.2008.

***Zelodia ratanae* Sharkey sp.n.**
urn:lsid:zoobank.org:act:2738BC9E-B243-45EE-B970-90AE358BBDB7
http://species-id.net/wiki/Zelodia_ratanae
Fig. 14

Diagnosis. Hind tibia mostly pale, extreme base cream, apex black, most of dorsal and ventral surfaces black, otherwise orange.

Description. Body length 7.6 mm. **Head.** 42 flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex densely and heavily punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells and veins melanic in basal 3/5, cells hyaline basally with white setae, veins R1, RS, r-m, and M yellow distally, stigma yellow in apical third. Hind tarsal claw bifid. Length/width of hind femur 2.4/0.8 = 3.2. Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.112/1.245 = 0.88. Ratio of widest point of MT1 to narrowest point 1.2/0.4. **Color.** Black except as follows; scape yellow, margins of prothorax cream colored to yellow, legs with extensive orange and/or yellow, scutellar sulcus, lateral and posterior areas of scutellum, and much of metapectal-propodeal complex, yellowish orange, anterior laterotergites and sterna pale brown.

Molecular data. TaxaBank#/Genbank Accession: H273 /JQ763452.

Distribution. Found only at the type locality in southern peninsular Thailand. Distribution map can be found at http://purl.org/thaimap/ratanae

Etymology. Dedicated to Ms. Ratana Luckanawarakul. She is currently the director of the Recreation and Interpretation Division of the Thai Department of National Parks. Ratana was of great assistance to us on numerous field trips and was always the best of company.

Material examined. Holotype ♂. H0273 [QSBG], Thailand, Khao Pu-Khao Ya NP, 75m, 7.551°N, 99.789°E, MT, 8–10.v.2006.

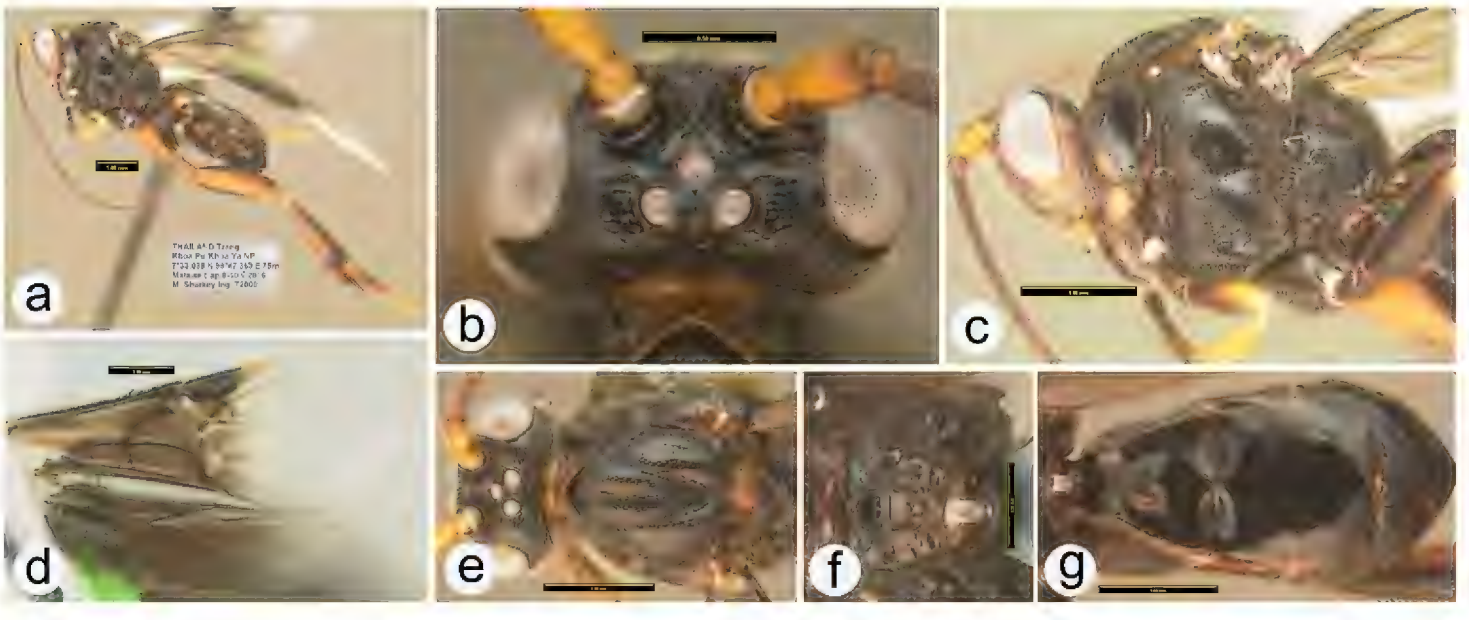

Figure 14. *Zelodia ratanae* sp.n. **a** lateral habitus **b** dorsal head **c** lateral head and mesosoma **d** wings **e** dorsal head and mesosoma **f** dorsal propodeum **g** dorsal metasoma.

***Zelodia saksiti* Sharkey sp.n.**
urn:lsid:zoobank.org:act:AE7C81C4-5E9B-477E-87A0-D80FC221940F
http://species-id.net/wiki/Zelodia_sakstii
Fig. 15

Diagnosis. Mesoscutum mostly melanic except margins pale; hind tibia mostly pale except apex black; propodeum color mostly or entirely melanic.

Description. Body length 8.4 mm (7.2–8.4). **Head.** 41 (40–41) flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells weakly infuscate, veins melanic. Hind tarsal claw bifid. Length/width of hind femur 2.007/0.533 = 3.8 (3.8–4.0). Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.318/0.62 = 2.1 (2.0–2.1). Ratio of widest point of MT1 to narrowest point 0.620/0.389 = 1.6 (1.6–1.7). **Color.** Mottled yellow, orange, cream-colored and black, head yellow except antenna black, hind leg black except most of tibia pale.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H036/ATRMK142-09/JQ763444.

Distribution. Widespread throughout western Thailand. Distribution map can be found at http://purl.org/thaimap/saksiti

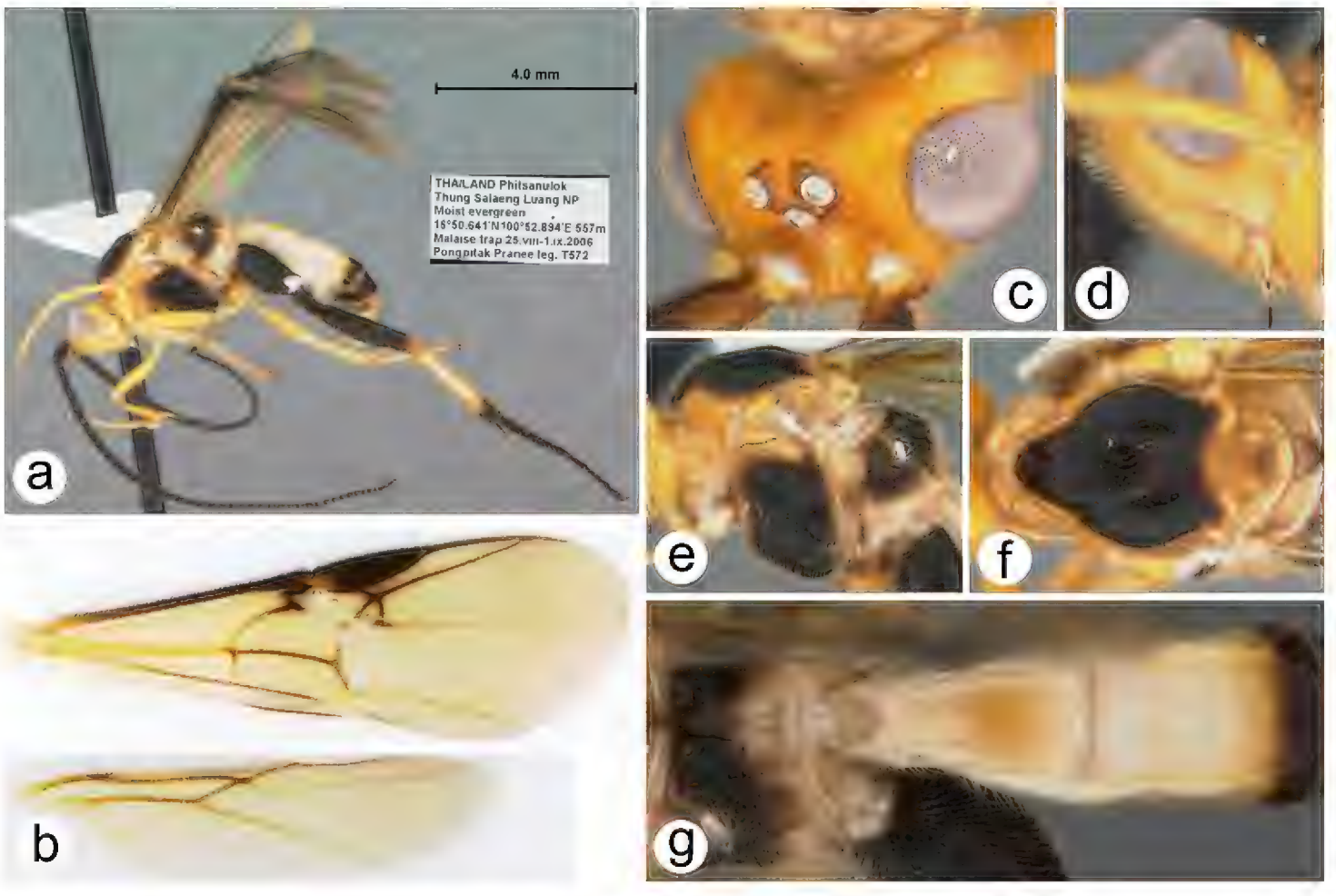

Figure 15. *Zelodia saksiti* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1-MT3.

Etymology. Dedicated to Saksit Poonsapsiri, one of the chiefs of Phataem National Park.

Material examined. Holotype ♀. H0324 [QSBG], Thailand, Khao Sok NP, Head quarters, 115m, 8.915°N, 98.53°E, MT, 12-19.v.2009.

Paratypes. ♂, Thailand: Salaeng Luang NP: 557m, 16.844°N, 100.882°E, MT, 25.viii–1.ix.2006: H0036 [QSBG], H8464 [UKM]; 479m, 16.839°N, 100.863°E, MT, 11–18.viii.2006: H5996 [QSBG]; ♀, Khao Sok NP, Headquarters, 155m, 8.915°N, 98.53°E, MT, 9–16.vi.2009: H0663 [HIC]; ♂, evergreen forest, MT, 1988: H8490[BMNH]; ♀, Kaeng Krachan NP, km16/road/stream2, 320m, 12.802°N, 99.444°E, MT, 25.v–1.vi.2009: H0920 [HIC]; ♀, Doi Chiangdao NP: Headquarters, 491m, 19.405°N, 98.922°E, MT, 18–25.ix.2007: H4108 [QSBG]; Pha Tang substation, 526m, 19.416°N, 98.915°E, MT, 28.viii–4.ix.2007: H5967 [UKM].

Zelodia surachaii Sharkey sp.n.

urn:lsid:zoobank.org:act:D1619B8D-BE53-440D-A637-B1A40338B4A7
http://species-id.net/wiki/Zelodia_surachaii
Fig. 16

Diagnosis. Mesoscutum entirely melanic; hind tibia all melanic; head (not including mouthparts or antenna) melanic; apex of flagellum pale, contrasting with melanic base. Median tergite 1 white or cream colored.

Description. Body length 6.6 mm (6.6–8.3). **Head.** 41 flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron with moderately dense setae. Fore wing cells weakly infuscate, veins and stigma melanic. Hind tarsal claw bifid. Length/width of hind femur 2.019/0.511 = 4.0 (4.0–4.7). Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.117/0.518 = 2.2 (2.2–2.3). Ratio of widest point of MT1 to narrowest point 0.518/0.427 = 1.2 (1.2–1.4). **Color.** Black except mouthparts yellow, apical 12 flagellomeres yellowish brown, MT1 cream colored, L1 and L2 and basal sterna white.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H389/ATRMK207-11/JQ763445.

Distribution. Taiwan, peninsular Malaysia and Thailand. Distribution map can be found at http://purl.org/thaimap/surachaii

Etymology. Dedicated to Mr. Surachai Pransil, chief of Khao Kitchagoot National Park.

Material examined. Holotype ♀. H0389 [QSBG] Thailand, Kaeng Krachan NP, Panernthung/km27, 950m, 12.819°N, 99.375°E, MT, 18–25.vii.2008.

Paratypes. ♀, Malaysia, Cameron Highlands, Tanah Rata, 4.475°N, 101.38°E, MT, iii–iv.2001: H1122 [UKM]; ♂, Taiwan, Taipei Co., Chuntou, 9.iv.1999: H8492 [FSCA].

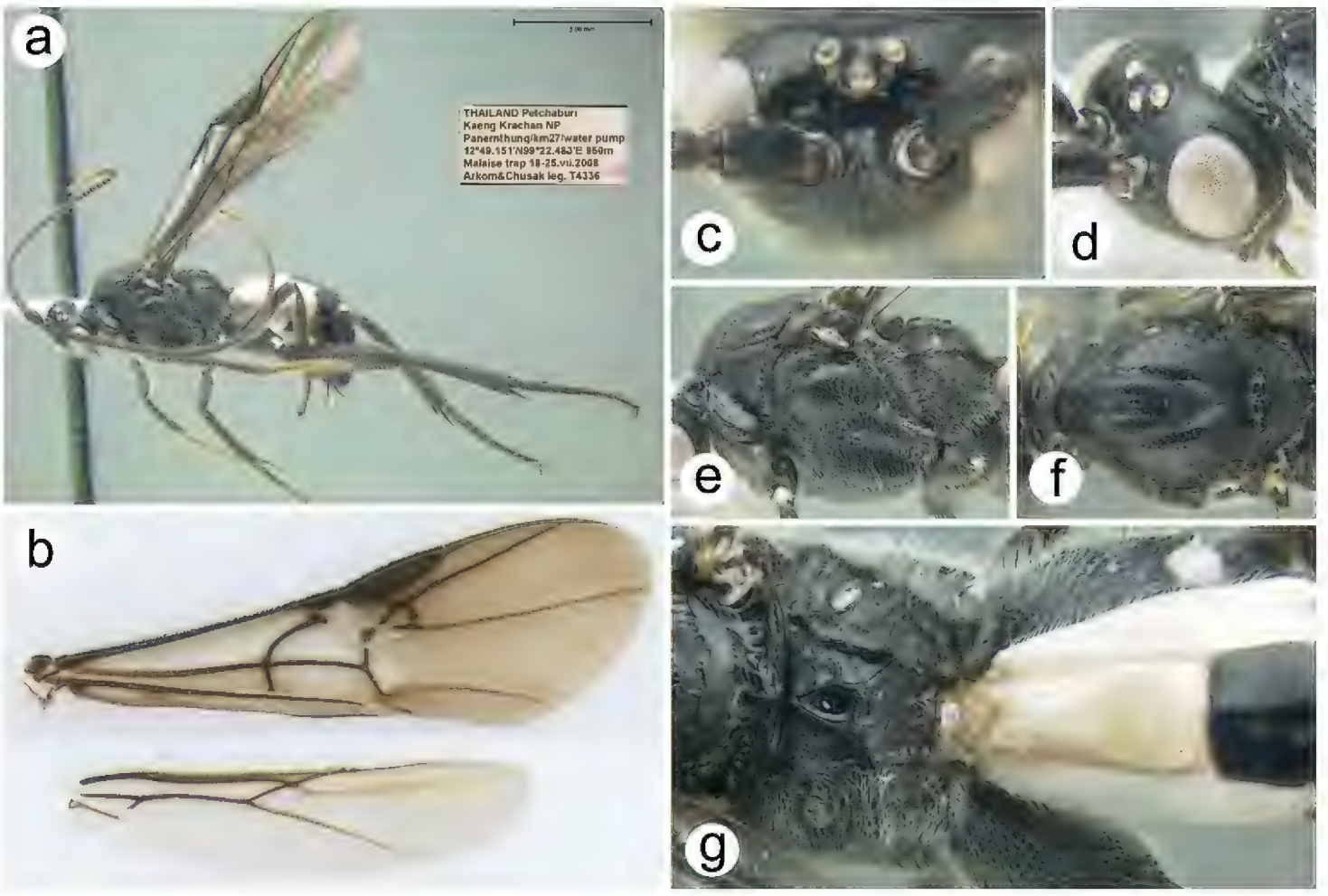

Figure 16. *Zelodia surachaii* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** dorsolateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1-MT2.

Zelodia suyaneeae **Sharkey sp.n.**
urn:lsid:zoobank.org:act:5B1641DD-9A03-4B56-B7B7-8A1749AE17FE
http://species-id.net/wiki/Zelodia_suyaneeae
Fig. 17

Diagnosis. Hind femur all pale; mesoscutum entirely pale; hind tibia mostly pale except apex and sometimes extreme base black; stigma partly or entirely yellow; median ocellus distinctly narrower than space between lateral ocelli; lateral surface of hind femur sparsely punctate, spaces between punctures wider than diameter of punctures.

Description. Body length 5.7 mm (5.7–6.4). **Head.** 40 (40–45) flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly infuscate apically, veins yellow basally, melanic apically and around parastigma, stigma yellow in basal third. Hind tarsal claw bifid. Length/width of hind femur 1.856/0.531 = 3.5 (3.4–4.4). Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 0.87/0.434 = 2.0 (2.0–2.5). Ratio of widest point of MT1 to narrowest point 0.434/0.269 = 1.3 (1.3 – 1.4).

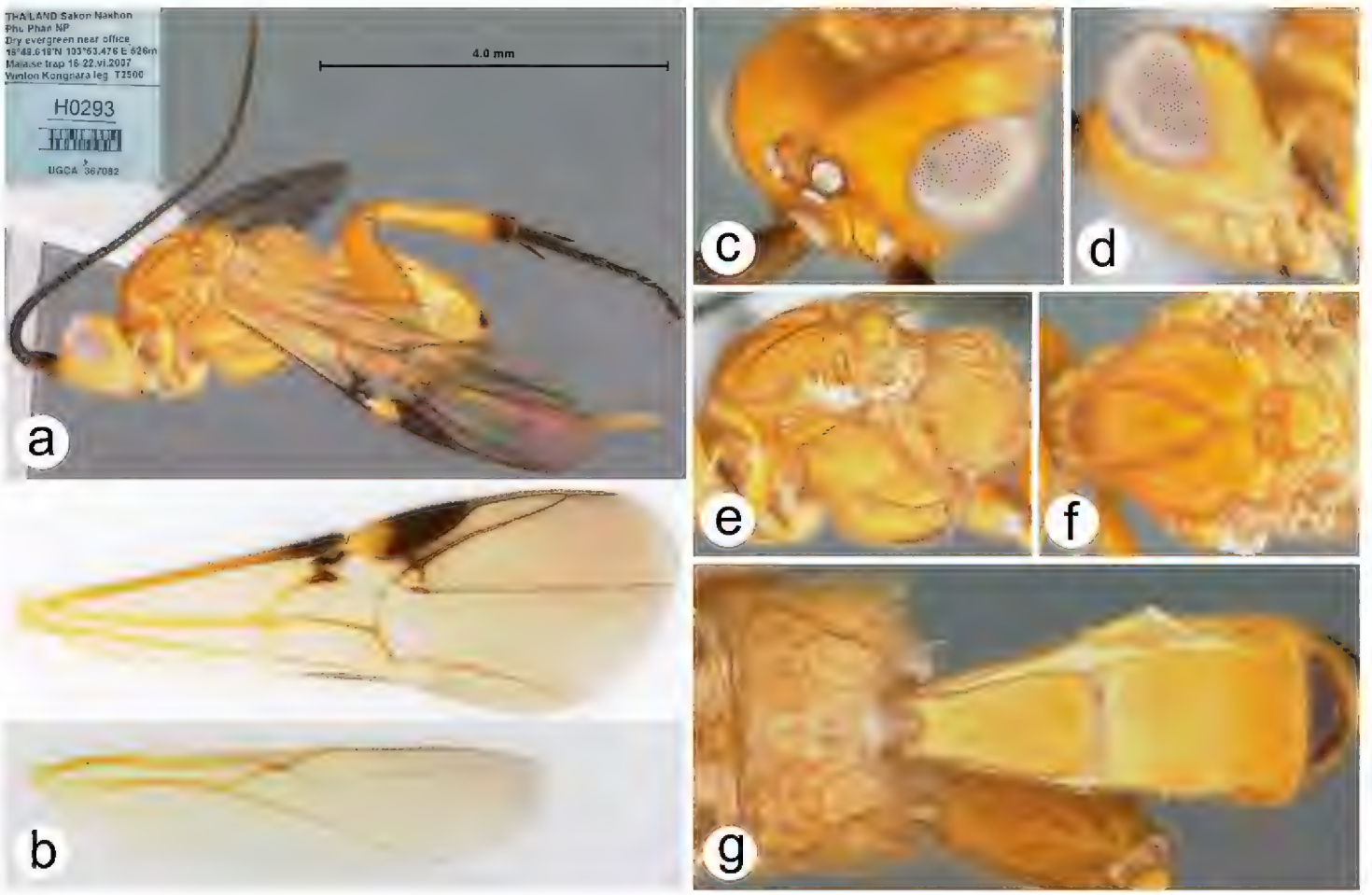

Figure 17. *Zelodia suyaneeae* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** dorsolateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and metasoma.

Color. Yellow except as follows: flagellum melanic, lateral surface of scape brown, apex of hind tibia and entire tarsus melanic.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H1603/ATRMK321-11/JQ763446; H383/ATRMK206-11/JQ763447.

Distribution. Widespread in northern and central Thailand. Distribution map can be found at http://purl.org/thaimap/suyaneeae

Etymology. Dedicated to Dr. Suyanee Vessabutr. She was the deputy director of QSBG and was of great assistance to us in providing space and resources at the museum.

Material examined. Holotype ♀. H1603 [QSBG], Thailand, Chae Son NP, Visitor center, 18.836°N, 99.4739°E, MT, 15-22.ix.2007.

Paratypes. ♀, Thailand, Khuean Srinagarindra NP, 210m, 14.5°N, 98.884°E, MT, 26.iii-2.iv.2009: H0355 [QSBG], H0359 [QSBG]; 22–29.i.2009: H0383 [HIC]; Chae Son NP, Nature Trail; 507m, 18.836°N, 99.473°E, MT, 14–21.x.2007: H4103 [HIC]; 1–8.x.2007: H4119 [HIC]; Doi Chiangdao NP, Headquarters, 491m, 19.405°N, 98.922°E, MT: 18–25.ix.2007: H4113 [HIC]; 19.404°N, 98.9218°E, MT, 21–27.v.2008: H0891 [UKM]; Phu Kradueng NP, 274m, 16.942°N, 101.694°E, MT, 26.iv–3.v.2008: H0572 [UKM]; Kaeng Krachan NP,km16/road/stream2, 320m, 12.802°N, 99.444°E, MT, 25.v–1.vi.2009: H0921 [UKM]; ♂, Phu Phan NP, 526m, 16.81°N, 103.891°E, MT, 16–22.vi.2007: H0293 [QSBG].

***Zelodia toyae* Sharkey sp.n.**
urn:lsid:zoobank.org:act:26B4E73C-65B5-4589-AB1D-BBD907DE0FDA
http://species-id.net/wiki/Zelodia_toyae
Fig. 18

Diagnosis. Hind femur all pale; mesoscutum entirely pale; hind tibia mostly pale except apex black; median ocellus about as wide as or wider than space between lateral ocelli; stigma partly yellow.

Description. Body length 7.6 mm. **Head.** 41 flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly infuscate apically, veins yellow basally except costa mostly melanic, veins melanic apically and around parastigma, stigma yellow in basal third. Hind tarsal claw bifid. Length/width of hind femur 2.25/0.54 = 4.2. Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.28/0.59 = 2.2. Ratio of widest point of MT1 to narrowest point 0.59/0.325 = 1.8. **Color.** Yellow except as follows: flagellum melanic, lateral surface of scape brown, apex of hind tibia and entire tarsus melanic.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H381/ATRMK205-11/JQ763448.

Distribution. Known only from the type locality in northwestern Thailand. Distribution map can be found at http://purl.org/thaimap/toyae

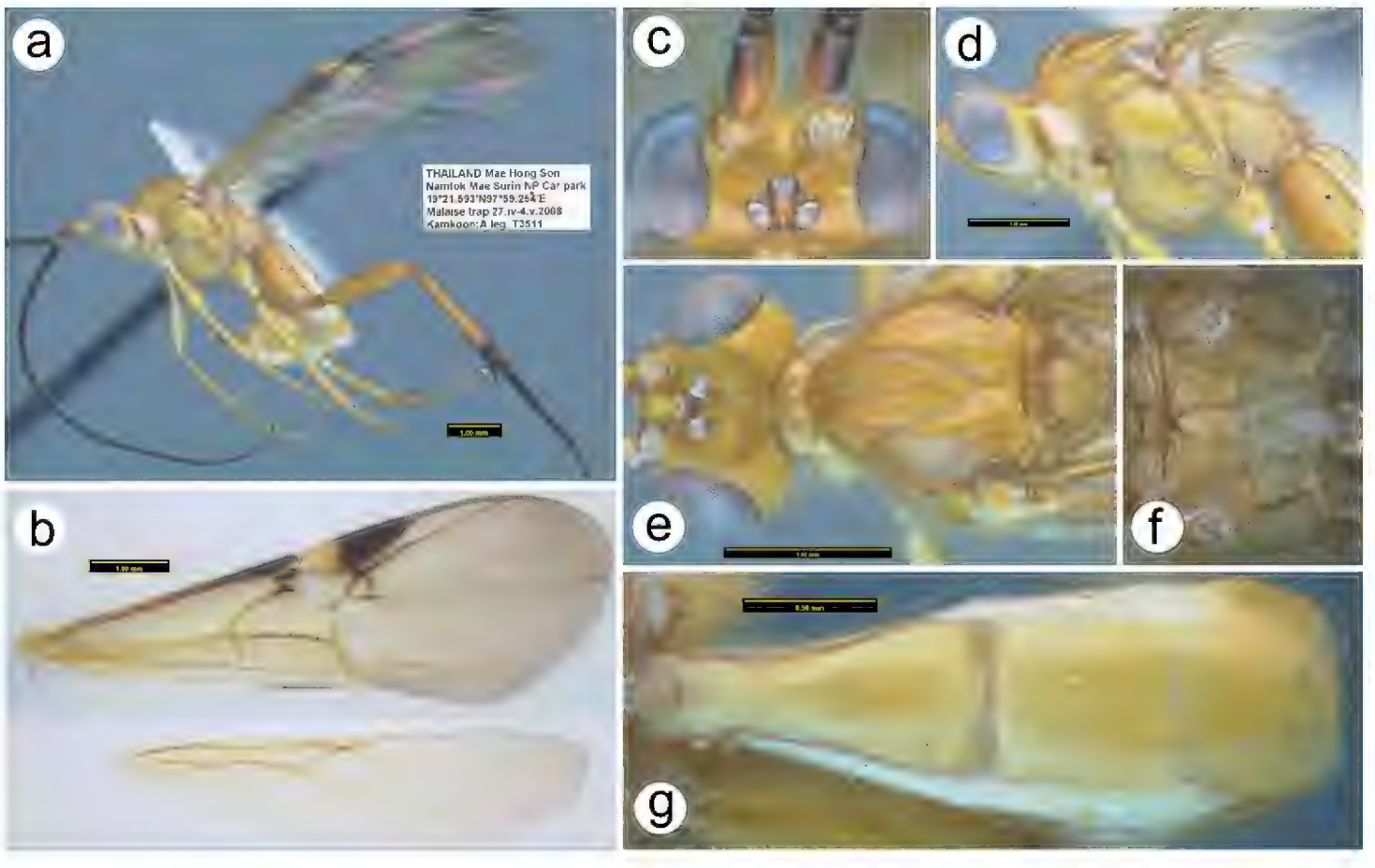

Figure 18. *Zelodia toyae* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head and mesosoma **e** dorsal head and mesosoma **f** dorsal propodeum **g** dorsal metasoma.

Etymology. Dedicated to Ms. Chayanit (Toy) Satatha. Toy was the sorter of Diptera for the TIGER project and is currently a technician at QSBG. The species name reflects her nick-name, Toy.

Material examined. Holotype ♀. H0381 [QSBG], Thailand, Namtok Mae Surin NP, Car park, 19.36°N, 97.988°E , MT, 27.iv–4.v.2008.

***Zelodia uthaii* Sharkey sp.n.**
urn:lsid:zoobank.org:act:1BE5192A-344A-4A1D-9959-0255A5A9976A
http://species-id.net/wiki/Zelodia_uthaii
Fig. 19

Diagnosis. Mesoscutum mostly melanic except margins pale; hind tibia mostly pale except apex and extreme base black; hind femur all melanic; apical half of wing not noticeably more infuscate than base.

Description. Body length. 6.1 mm. **Head.** 42 flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly infuscate distally, veins yellow basally except costa black, veins melanic distally, stigma melanic. Hind tarsal claw bifid.

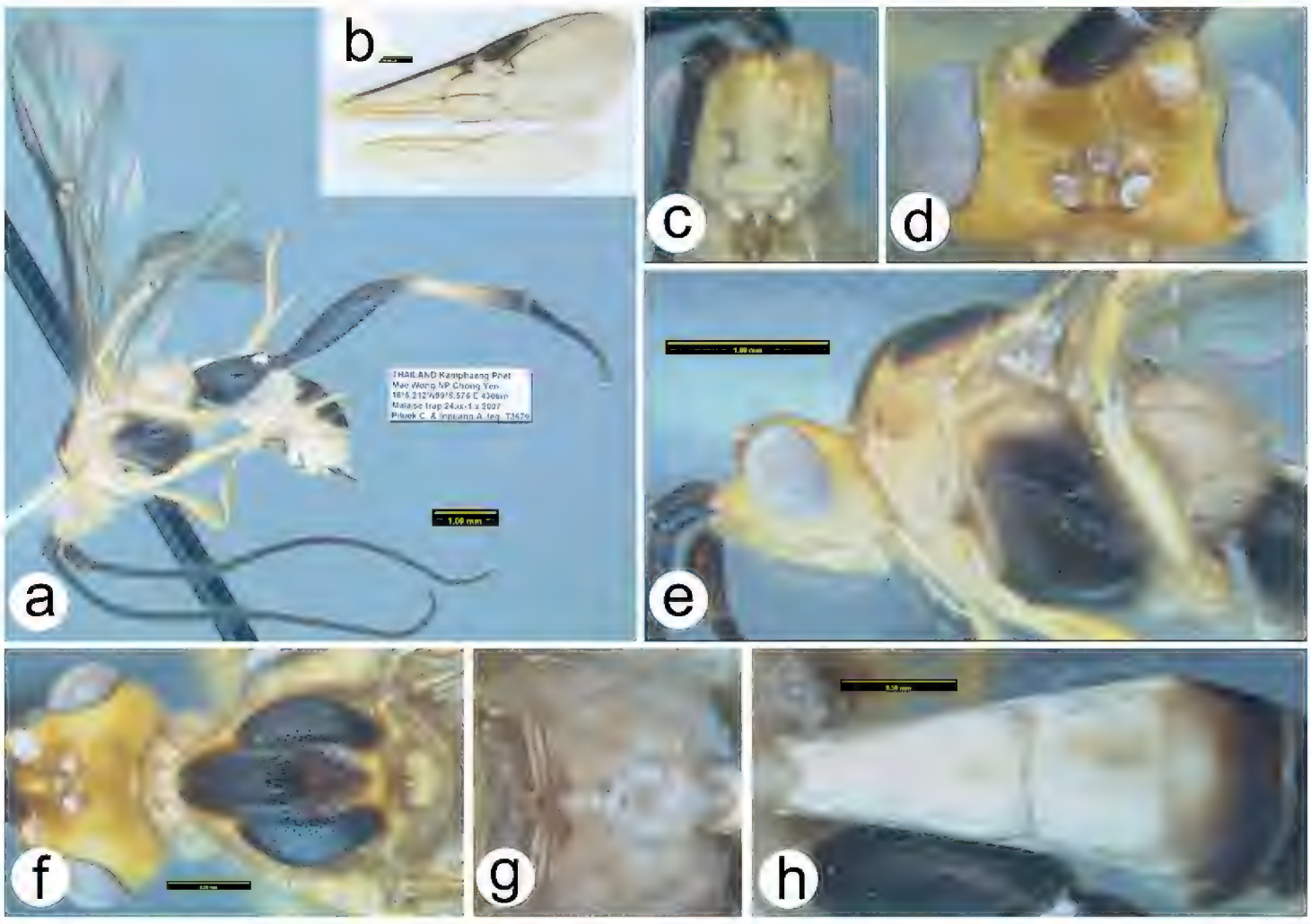

Figure 19. *Zelodia uthaii* sp.n. **a** lateral habitus **b** wings **c** anterior head **d** dorsal head **e** lateral head and mesosoma **f** dorsal head and mesosoma **g** dorsal propodeum **h** dorsal MT1–MT3.

Length/width of hind femur 2.05/0.54 = 3.8. Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.13/0.61 = 1.9. Ratio of widest point of MT1 to narrowest point 0.61/0.38 = 1.6. **Color.** Mottled yellow, cream-colored and black, head yellow except antenna black, hind leg black except most of tibia pale.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H309/ATRMK450-11/JQ763449.

Distribution. Known only from the type locality in western Thailand. Distribution map can be found at http://purl.org/thaimap/uthaii

Etymology. Dedicated to Mr. Uthai Promnaree, one of the chiefs of Phataem National Park.

Material examined. Holotype ♀. H0309 [QSBG], Thailand, Mae Wong NP, Chong Yen, 1306m, 16.087°N, 99.11°E, MT, 24.ix–1.x.2007.

***Zelodia wangi* Sharkey sp.n.**
urn:lsid:zoobank.org:act:14DE5D59-9589-46DA-AE41-D0530F98EB1C
http://species-id.net/wiki/Zelodia_wangi
Fig. 20

Diagnosis. Scutum and MT1 yellow; hind leg, including tibia, melanic.

Description. Body length 6.7 mm (6.5–7.1). **Head.** 43 (41–45) flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells very weakly infuscate with a yellowish tinge basally, veins yellow basally, melanic in apical half, stigma yellow in basal fourth (or entirely melanic). Hind tarsal claw bifid. Length/width of hind femur 2.0/0.5 = 3.9 (3.7–3.9). Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.156/0.481 = 2.4 (2.4–2.5). Ratio of widest point of MT1 to narrowest point 0.481/0.349 = 1.4 (1.4). **Color.** Yellow except as follows: scape and pedicel pale brown, flagellum brown, hind leg mostly brown in females with areas near joints and most of tibia pale brown to yellow, anterior metasomal laterotergites and sterna cream-colored, median tergites entirely yellow in holotype (but some female paratypes have pale brown markings on apical tergites; males as in females but with hind leg mostly to entirely black, and apical terga and sterna extensively black).

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H074/JQ763457; H023/JQ763455; H073/JQ763456; H019/JQ763458; H025/JQ763460; H084/JQ763459.

Distribution. Widespread throughout Thailand. Distribution map can be found at http://purl.org/thaimap/wangi

Etymology. Dedicated to Mr. Wang Saeyang, who was the sorter for Hymenoptera for the TIGER project.

Material examined. Holotype ♀. H0057 [QSBG], Thailand, Khoa Chong, Forest Research Stn., 75m, 7.551°N, 99.789°E, MT, vii–xi.2005.

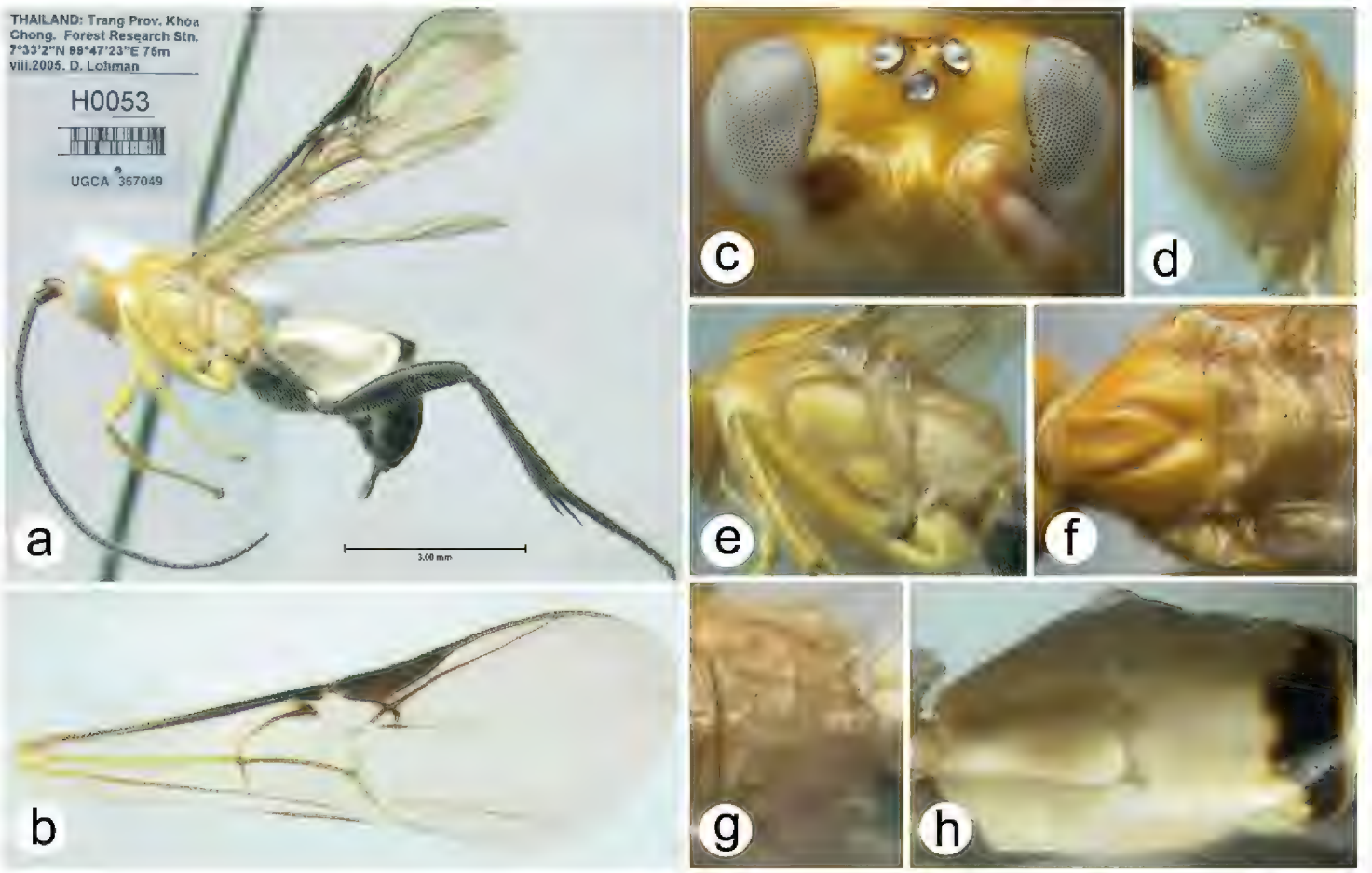

Figure 20. *Zelodia wangi* sp. n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum **h** dorsal MT1–MT3.

Paratypes. ♀, Thailand: Khoa Chong, Forest Research Stn., 75m, 7.551°N, 99.789°E, MT, xi.2005: H0019 [QSBG], H5990 [UKM], H0084 [HIC]; x.2005: H0023 [QSBG]; viii.2005: H0054 [QSBG], H5906 [UKM], H5988 [UKM], H5991 [UKM], H5994 [UKM], H0061 [UKM]; ♂, x.2005: H5992 [UKM]; viii.2005: H5986 [UKM]; ♀, Thailand, Nayong Khaochong, 75m, 7.561°N, 99.886°E, MT, 24–27.vi.2005: H0025 [QSBG], H0034 [QSBG]; ♀, Nayong Khaochong, 75m, 7.561°N, 99.886°E, MT, 15–18.vi.2005: H0074 [HIC]; 6-8.vii.2005: H0076 [HIC]; ♂, 26–30.vii.2005: H0073 [HIC]; ♀, Khao Sok NP, Headquarters, 115m, 8.915°N, 98.53°E, MT, 12–19.v.2009: H0391 [QSBG]; 17–24.iii.2009: H0475 [QSBG]; 8–15.ix.2008: H0477 [QSBG]; ♂, 28.x–4.xi.2008: H0304 [QSBG]; 25.xi-2.xii.2008: H0310 [QSBG]; 28.iv–5.v.2009: H0332 [QSBG]; 21-28.iv.2009: H0592 [UKM]; 9–16.xii.2008: H0673 [HIC]; 18–25.xi.2008: H0675 [HIC]; 24-31.iii.2009: H0683 [HIC]; 31.viii–8.ix.2008: H0758 [HIC]; 9–16.vi.2009: H0972 [HIC], H0691 [HIC], H0666 [UKM]; ♂, Namtok Yong NP, 95m, 8.174°N, 99.742°E, MT, 9–16.ii.2009: H0351 [QSBG]; Namtok Mae Surin NP, Near Visitor Ctr, 228m, 19.358°N, 97.988°E, MT, 8–15.vii.2007: H5987 [UKM], H0617 [UKM], H0620 [UKM]; Namtok Mae Surin NP, 334m, 19.344°N, 97.988°E, MT, 26.viii–2.ix.2007: H5980 [HIC]; ♂, Namtok Yong NP, 80m, 8.174°N, 99.742°E, MT, 23–30.ix.2008: H0979 [HIC]; Mae Surin near visitor center, 228m, 19.489°N, 98.056°E, MT. 15–22.vii.2007: H0442 [QSBG], H0443 [QSBG]; ♀, Khao Pu-Khao Ya NP, 75m, 7.551°N, 99.789°E, MT, 28–30.v.2006: H5989 [UKM], H5995 [UKM]; 10–13.ii.2006:

H5993 [UKM]; Tat Tone NP, 250m, 15.984°N, 102.035°E, litter, 23–26.vi.2006: H5997 [UKM]; Kaeng Krachan NP, km33/helipad, 735m, 12.836°N, 99.345°E, MT, 18–25.ii.2009: H0623 [UKM]; ♂, Doi Chiangdao NP, Pha Tang substation, 526m, 19.4163°N, 98.9147°E, MT, 3–10.xii.2007: H0926 [HIC].

***Zelodia wichaii* Sharkey sp.n.**
urn:lsid:zoobank.org:act:3FF67B83-DB04-4CB8-A339-47B60BB77C10
http://species-id.net/wiki/Zelodia_wichaii
Fig. 21

Diagnosis. Hind femur all pale; mesoscutum entirely pale; hind tibia mostly pale except apex black; stigma partly or entirely yellow; ocelli median ocellus distinctly narrower than space between lateral ocelli; lateral surface of hind femur densely punctate to aciculate, spaces between punctures not wider than diameter of punctures.

Description. Body length 6.3 mm (6.0–6.4). **Head.** 40 flagellomeres. Median ocellus diameter narrower than space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly

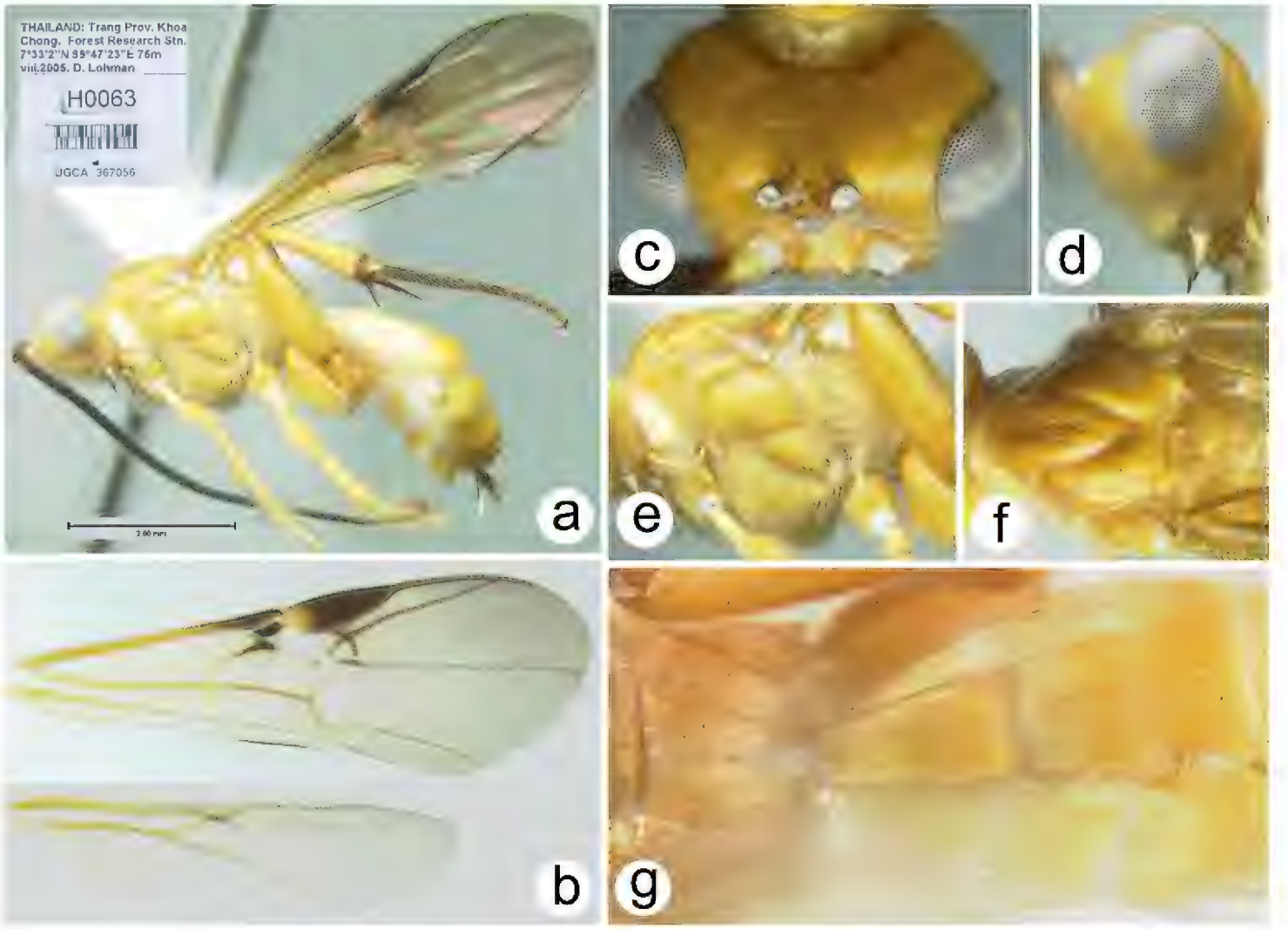

Figure 21. *Zelodia wichaii* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1–MT3.

infuscate apically, veins yellow basally, melanic apically and around parastigma, stigma yellow in basal third. Hind tarsal claw bifid. Length/width of hind femur 1.027/0.519 = 3.7 (3.4–3.7). Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 1.038/0.49 = 2.1 (2.0–2.1). Ratio of widest point of MT1 to narrowest point 0.49/0.313 = 1.6. **Color.** Yellow except as follows: antenna melanic, apex of hind tibia and entire tarsus melanic.

Molecular data. TaxaBank#/Genbank Accession: H063/JQ763453.

Distribution. Recorded from two localities in peninsular Thailand. Distribution map can be found at http://purl.org/thaimap/wichaii

Etymology. Dedicated to Mr. Wichai Srisuka, the curator of insects at QSBG.

Material examined. Holotype ♀. H0063 [QSBG], Thailand, Khoa Chong, Trang, 75m, 7.551°N 99.789°E, MT, viii.2005.

Paratype. ♀, Thailand, Namtok Yon NP, Klong Jang Waterfall, 154m, 8.338°N, 99.827°E, MT, 12–19.v.2009: H0594 [HIC].

Zelodia wirati Sharkey sp.n.

urn:lsid:zoobank.org:act:73E375A4-5D6C-4668-9A49-95F6BB6B1E5A
http://species-id.net/wiki/Zelodia_wirati
Fig. 22

Diagnosis. Hind tibia mostly pale except apex black; hind femur all melanic; mesoscutum entirely pale; median ocellus about as wide as or wider than space between lateral ocelli.

Description. Body length 6.9 mm (male 5.8 – 6.7 mm). **Head.** 41 flagellomeres (41–43 males). Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli partly smooth, otherwise with weak punctures. Metapleuron sparsely covered with setae. Fore wing cells hyaline basally, weakly infuscate apically, veins yellow basally, except costa mostly melanic, melanic apically and around parastigma, stigma yellow in basal fifth. Hind tarsal claw bifid. Length/width of hind femur 2.28/.58 = 3.9 (3.45 – 3.52 males). Lateral surface of hind femur punctate. **Metasoma.** Length/width ratio of MT1, 1.22/.633 = 1.93. Ratio of widest point of MT1 to narrowest point .633/.385 = 1.6 (1.4–1.6). **Color.** Mostly yellow, black as follows: antenna except scape brown medially, hind leg except basal 4/5 of tibia yellow.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H012/JQ763454; H949/ATRMK451-11/JQ763450.

Distribution. Recorded from three localities in northwestern Thailand. Distribution map can be found at http://purl.org/thaimap/wirati

Etymology. Dedicated to Mr. Wirat Sukho, collector for the TIGER project at Khao Yai National Park.

Material examined. Holotype ♀. H0981 [QSBG], Thailand, Doi Phahompok NP, 569m, 19.966°N, 99.156°E, MT, 28.viii–4.ix.2007.

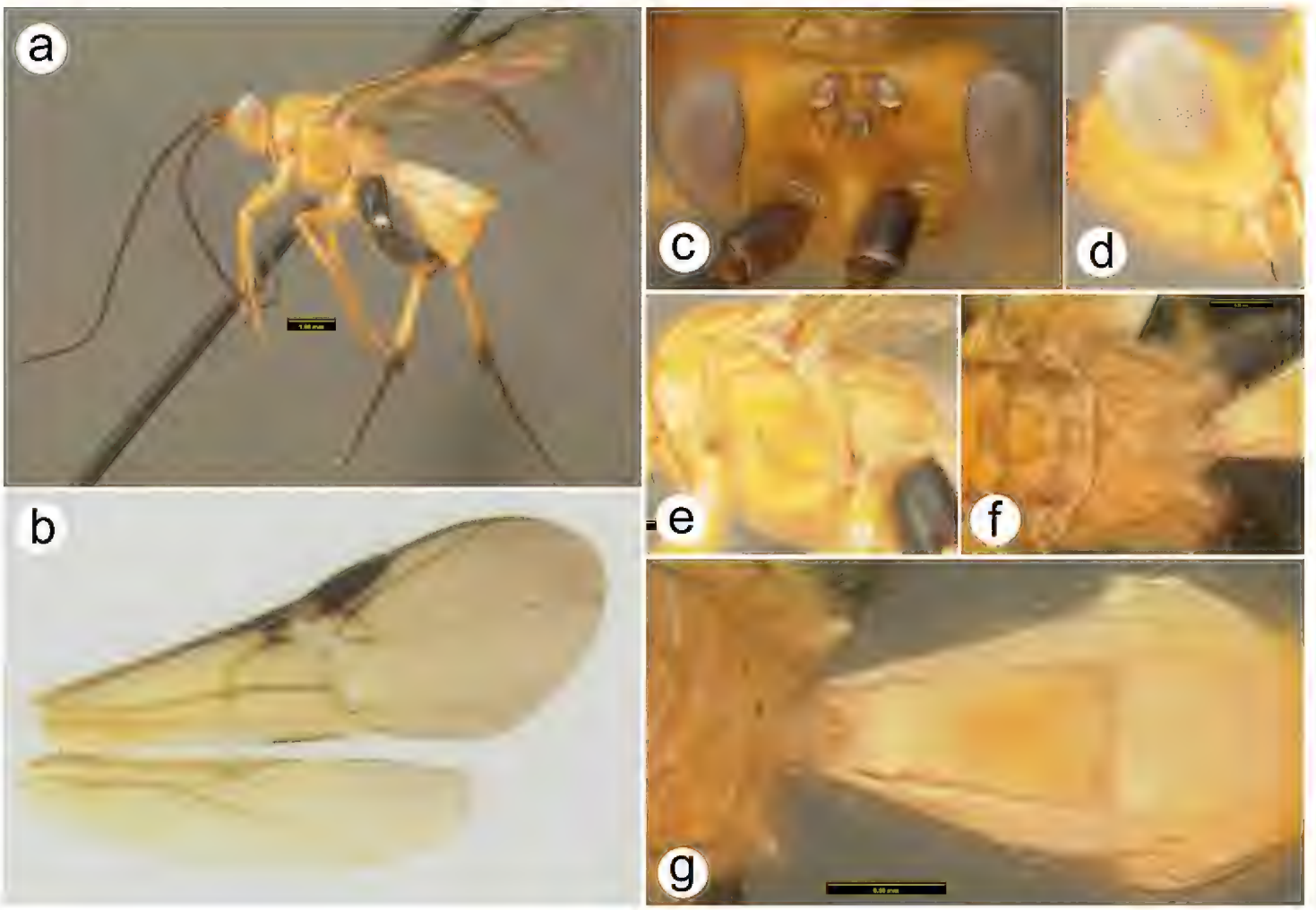

Figure 22. *Zelodia wirati* sp.n. **a** lateral habitus **b** wings **c** dorsal head **d** lateral head **e** lateral mesosoma **f** dorsal propodeum **g** dorsal MT1–MT2.

Paratypes. ♂ Thailand: Doi Inthanon NP, campground pond, 1200m, 18.544°N, 98.525°E, MT, 16–24.viii.2006: H0012 [QSBG]; Doi Chiangdao NP, Headquarters, 491m, 19.404°N, 98.9218°E, MT, 15–22.iv.2008: H0909 [HIC]; Chae Son NP, Doi Laan, 1528m, 18.825°N, 99.411°E, MT, 22–28.iii.2008: H949 [UKM].

***Zelodia wirotei* Sharkey sp.n.**
urn:lsid:zoobank.org:act:8895B38A-E94B-42C3-82E8-77E10978141D
http://species-id.net/wiki/Zelodia_wirotei
Fig. 23

Diagnosis. Hind tibia all melanic; mesoscutum entirely pale; MT1 all white or cream colored, sometimes with a bit of melanic color subapically.

Description. Body length 5.9 mm. **Head.** 35 (35–37) flagellomeres. Median ocellus diameter equal to the space between lateral ocelli. Vertex sparsely and weakly punctate. **Mesosoma.** Notauli mostly or entirely crenulate. Metapleuron densely covered with setae. Fore wing cells all weakly infuscate, veins all melanic. Hind tarsal claw bifid. Length/width of hind femur 1.714/0.475 = 3.5 (3.5–3.7).

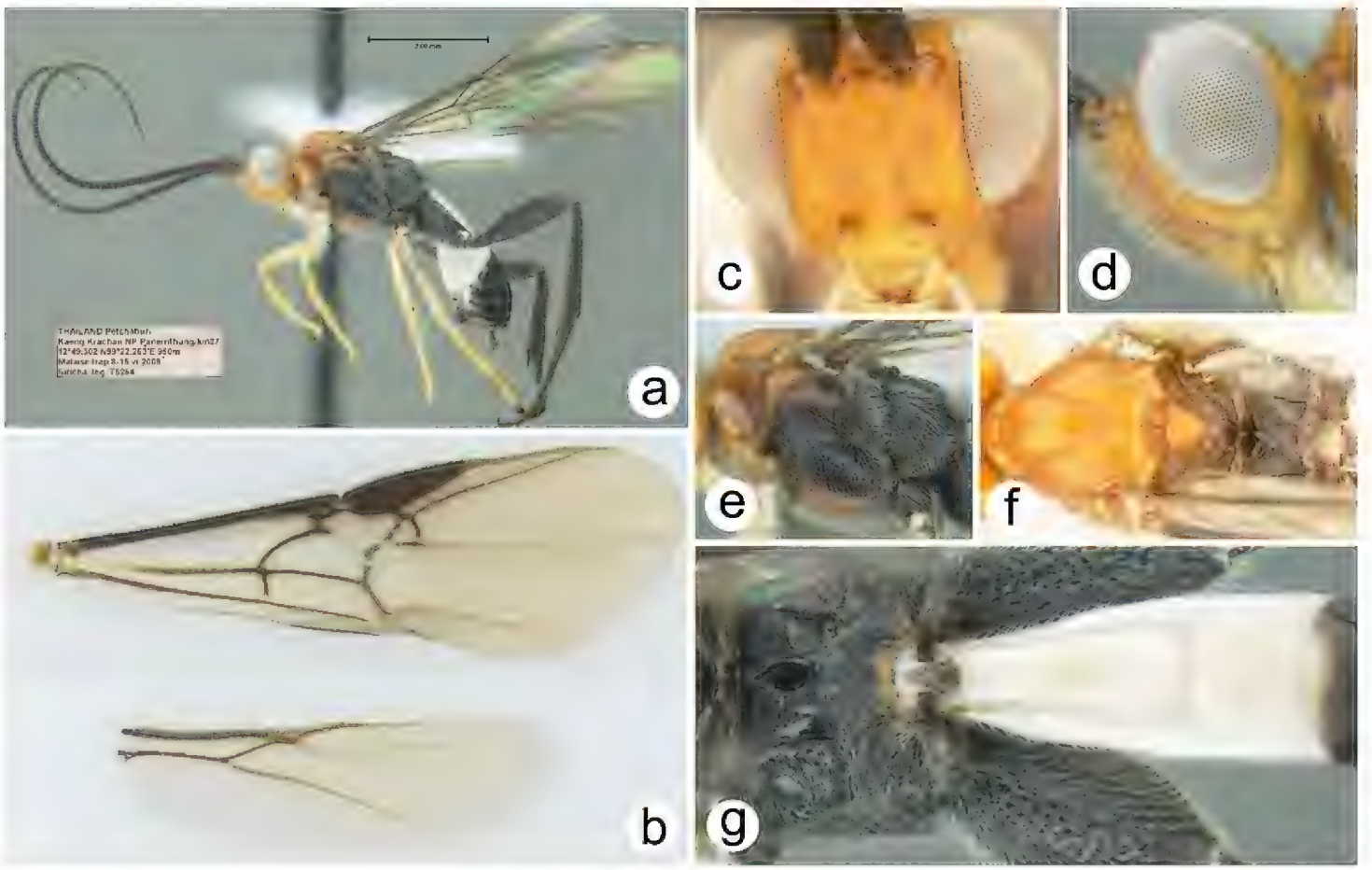

Figure 23. *Zelodia wirotei* sp.n. **a** lateral habitus **b** wings **c** anterior head **d** lateral head **e** lateral mesosoma **f** dorsal mesosoma **g** dorsal propodeum and MT1–MT2.

Lateral surface of hind femur aciculate. **Metasoma.** Length/width ratio of MT1, 3.978/0.350 = 2.8 (2.8–3.0). Ratio of widest point of MT1 to narrowest point 0.350/0.248 = 1.4. **Color.** Mostly black with orange, white, brown and cream color; head mostly orange, except area around ocelli slightly darker and antenna black; prothorax orange to brown; mesoscutum orange; scutellum brown, mesopleuron mostly black but orange-brown dorsally; fore leg yellow to cream colored; mid leg yellow to cream colored except coxa mostly melanic; MT1, M2 and part of MT3 cream colored (MT1 sometimes with a tan area posteromedially); anterior laterotergites and sterna white.

Molecular data. TaxaBank#/BOLD Process ID/Genbank Accession: H990/ATRMK272-11/JQ763451.

Distribution. Recorded only from the type locality south-west of Bangkok**.** Distribution map can be found at http://purl.org/thaimap/wirotei

Etymology. Dedicated to Mr. Wirote Naknan, chief of Namnao National Park.

Material examined. Holotype ♀. H0634 [QSBG], Thailand, Kaeng Krachan NP, km33/helipad, 735m, 12.836°N, 99.345°E, MT, 11–18.v.2009.

Paratype. ♀, Thailand, Kaeng Krachan NP, Panernthung/km27, 950m, 12.822°N, 99.371°E, MT, 8–15.vi.2009: H0990 [HIC].

Acknowledgements

We thank all of the staff at Queen Sirikit Botanic Gardens in Chiang Mai for sorting the many hundreds of samples and for the Thai park staff for running Malaise traps and other collection devices. Thanks to Dr. van Achterberg for the loan of type specimens. A special thanks to Chaweewan Hutacharern for managing the Thai end of the TIGER project. Funding was provided by NSF grants DEB-0542864 and EF-0337220.

References

Beckenbach AT, Robson SK, Crozier RH (2005) Single nucleotide +1 frameshifts in an apparently functional mitochondrial cytochrome b gene in ants of the genus *Polyrhachis*. Journal of Molecular Evolution 60(2): 141–52. doi: 10.1007/s00239-004-0178-5

Bhat S, Gupta VK, (1977) The subfamily Agathidinae (Hymenoptera, Braconidae) Ichneumonologia Orientalis, Oriental Insects Monograph. 6: 1–353, figs 1–37, maps 1–9, tabs. 1–9.

Dallwitz MJ, Paine TA, Zurcher EJ (1993 onwards) User's guide to the DELTA System: a general system for processing taxonomic descriptions. 4th edition. http://delta-intkey.com

Dallwitz MJ, Paine TA, Zurcher EJ (1995 onwards) User's guide to Intkey: a program for interactive identification and information retrieval. http://delta-intkey.com

Dallwitz MJ, Paine TA, Zurcher EJ (1999 onwards) User's guide to the DELTA Editor. http://delta-intkey.com

Goloboff PA, Farris JS, Nixon KC (2008) TNT, a free program for phylogenetic analysis. Cladistics 24: 774–786. doi: 10.1111/j.1096-0031.2008.00217.x

Nylander JAA (2004) MrModeltest v2. Program distributed by the author. Evolutionary Biology Centre, Uppsala University."

Ratnasingham S Hebert PDN (2007) BOLD : The Barcode of Life Data System (www.barcodinglife.org). Molecular Ecology Notes 7: 355–364. doi: 10.1111/j.1471-8286.2007.01678.x

Ronquist F, Huelsenbeck JP (2003) MRBAYES 3: Bayesian phylogenetic inference under mixed models. Bioinformatics 19: 1572–1574. doi: 10.1093/bioinformatics/btg180

Sharkey MJ (1992) Cladistics and tribal classification of the Agathidinae (Hymenoptera: Braconidae). Journal of Natural History 26: 425–447. doi: 10.1080/00222939200770251

Sharkey MJ, Clutts SA (2011) A revision of Thai Agathidinae (Hymenoptera: Braconidae), with descriptions of six new species. Journal of Hymenoptera Research 22: 69–132. doi: 10.3897/jhr.22.1299

Sharkey MJ, Laurenne NM, Sharanowski B, Quicke DLJ, Murray D (2006) Revision of the Agathidinae (Hymenoptera: Braconidae) with comparisons of static and dynamic alignments. Cladistics 22: 546–567. doi: 10.1111/j.1096-0031.2006.00121.x

Sharkey MJ, Wharton RA (1997) Morphology and terminology. In: Wharton RA, Marsh PM, Sharkey MJ (Eds), Manual of the New World genera of Braconidae (Hymenoptera). Special Publication of the International Society of Hymenopterists. Vol. 1, 19–38.

Sharkey MJ, Yu DS, van Noort S, Seltmann K, Penev L (2009) Revision of the Oriental genera of Agathidinae (Hymenoptera, Braconidae) with an emphasis on Thailand including interactive keys to genera published in three different formats. ZooKeys 21: 19–54. doi: 10.3897/zookeys.21.271

Swofford DL (2003) PAUP*. Phylogenetic Analysis Using Parsimony (*and Other Methods). Version 4. Sinauer Associates, Sunderland, Massachusetts.

van Achterberg C, Long KD (2010) Revision of the Agathidinae (Hymenoptera, Braconidae) of Vietnam, with the description of forty-two new species and three new genera. ZooKeys. 54: 1–184. doi: 10.3897/zookeys.54.475

Yoder MJ, Mikó I, Seltmann KC, Bertone MA, Deans AR (2010) A Gross Anatomy Ontology for Hymenoptera. PLoS ONE 5(12): e15991. doi: 10.1371/journal.pone.0015991

Yu DS, van Achterberg K, Horstmann K (2005) World Ichneumonoidea 2004. Taxonomy, biology, morphology and distribution. CD/DVD. Taxapad, Vancouver, Canada.

Appendix 1

DELTA data matrix, images, and other files to the dichotomous key for *Zelodia* (Hymenoptera: Braconidae: Agathidinae) from Thailand. doi: 10.3897/JHR.26.2527.app1

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Citation: Sharkey MJ, Stoelb SAC (2012) Revision of *Zelodia* (Hymenoptera, Braconidae, Agathidinae) from Thailand. Journal of Hymenoptera Research 26: 31–71. doi: 10.3897/JHR.26.2527.app1

Appendix 2

DELTA data matrix, images, and other files to species descriptions for *Zelodia* (Hymenoptera: Braconidae: Agathidinae) from Thailand. doi: 10.3897/JHR.26.2527.app2

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Citation: Sharkey MJ, Stoelb SAC (2012) Revision of *Zelodia* (Hymenoptera, Braconidae, Agathidinae) from Thailand. Journal of Hymenoptera Research 26: 31–71. doi: 10.3897/JHR.26.2527.app2

Appendix 3

Interactive key, in IntKey format, to *Zelodia* (Hymenoptera: Braconidae: Agathidinae) from Thailand. doi: 10.3897/JHR.26.2527.app3

Explanation note: To run the identification key, you will need Windows 95/NT or a later version.

You also need to download Intkey software and reboot your computer, if it is not already installed. The software package, Intkey, can be downloaded from http://delta-intkey.com/www/programs.htm. Once Intkey is installed you need only click on the .ink file (below) and the key will open. Click on any character on the left to begin.

More details on how to use Intkey efficiently are found at http://florabase.calm.wa.gov.au/help/keys/intkey_tutorial.pdf

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Citation: Sharkey MJ, Stoelb SAC (2012) Revision of *Zelodia* (Hymenoptera, Braconidae, Agathidinae) from Thailand. Journal of Hymenoptera Research 26: 31–71. doi: 10.3897/JHR.26.2527.app3

Appendix 4

Morphological terms matched to the Hymenoptera Anatomy Ontology. Identifiers (URIs) represent anatomical concepts in HAO version http://purl.obolibrary.org/obo/hao/2011-05-18/hao.owl

Abbreviations		URI
LT3	abdominal laterotergite 3	http://purl.obolibrary.org/obo/HAO_0001456
MT1	abdominal mediotergite 1	http://purl.obolibrary.org/obo/HAO_0001463
MT2	abdominal mediotergite 2	http://purl.obolibrary.org/obo/HAO_0001150
MT3	abdominal mediotergite 3	http://purl.obolibrary.org/obo/HAO_0001147
	antenna	http://purl.obolibrary.org/obo/HAO_0000101
	apical tarsomere	http://purl.obolibrary.org/obo/HAO_0000994
	area	http://purl.obolibrary.org/obo/HAO_0000146
	body	http://purl.obolibrary.org/obo/HAO_0000182
	carina	http://purl.obolibrary.org/obo/HAO_0000188
	costa	http://purl.obolibrary.org/obo/HAO_0000225
	coxa	http://purl.obolibrary.org/obo/HAO_0000228
	femur	http://purl.obolibrary.org/obo/HAO_0000327

Abbreviations		URI
	flagellomere	http://purl.obolibrary.org/obo/HAO_0000342
	flagellum, flagella	http://purl.obolibrary.org/obo/HAO_0000343
	fore leg	http://purl.obolibrary.org/obo/HAO_0000349
	fore wing	http://purl.obolibrary.org/obo/HAO_0000351
	frons	http://purl.obolibrary.org/obo/HAO_0001044
	head	http://purl.obolibrary.org/obo/HAO_0000397
	hind femur	http://purl.obolibrary.org/obo/HAO_0001140
	hind leg	http://purl.obolibrary.org/obo/HAO_0000399
	hind tarsus	http://purl.obolibrary.org/obo/HAO_0001141
	hind tibia	http://purl.obolibrary.org/obo/HAO_0000631
	lateral ocelli	http://purl.obolibrary.org/obo/HAO_0000481
	laterotergite	http://purl.obolibrary.org/obo/HAO_0001861
	leg	http://purl.obolibrary.org/obo/HAO_0000494
	median ocellus	http://purl.obolibrary.org/obo/HAO_0000526
	mediosternite	http://purl.obolibrary.org/obo/HAO_0001654
S2	mediosternite 2	http://purl.obolibrary.org/obo/HAO_0001829
S3	mediosternite 3	http://purl.obolibrary.org/obo/HAO_0001830
	mediotergite	http://purl.obolibrary.org/obo/HAO_0001860
	mesopleuron	http://purl.obolibrary.org/obo/HAO_0000566
	mesoscutum	http://purl.obolibrary.org/obo/HAO_0001490
	mesosoma	http://purl.obolibrary.org/obo/HAO_0000576
	mesothorax	http://purl.obolibrary.org/obo/HAO_0000583
	metapleuron	http://purl.obolibrary.org/obo/HAO_0001869
	metasoma	http://purl.obolibrary.org/obo/HAO_0000626
	metapectal-propodeal complex	http://purl.obolibrary.org/obo/HAO_0000604
	mid leg	http://purl.obolibrary.org/obo/HAO_0000636
	mouthparts	http://purl.obolibrary.org/obo/HAO_0000639
	notaulus	http://purl.obolibrary.org/obo/HAO_0000647
	ocellus	http://purl.obolibrary.org/obo/HAO_0000661
	ovipositor	http://purl.obolibrary.org/obo/HAO_0001004
	palpi	http://purl.obolibrary.org/obo/HAO_0000683
	pedicel	http://purl.obolibrary.org/obo/HAO_0000706
	propodeum	http://purl.obolibrary.org/obo/HAO_0001249
	prothorax	http://purl.obolibrary.org/obo/HAO_0000874
	puncture	http://purl.obolibrary.org/obo/HAO_0000885
	scape	http://purl.obolibrary.org/obo/HAO_0000908
	scutellar disc	http://purl.obolibrary.org/obo/HAO_0000915
	scutellar sulcus	http://purl.obolibrary.org/obo/HAO_0000917
	scutellum	http://purl.obolibrary.org/obo/HAO_0000572
	scutum	http://purl.obolibrary.org/obo/HAO_0000575
	metasomal segment	http://purl.obolibrary.org/obo/HAO_0001969
	seta	http://purl.obolibrary.org/obo/HAO_0000935
	sternite	http://purl.obolibrary.org/obo/HAO_0000955
	stigma	http://purl.obolibrary.org/obo/HAO_0000957
	tarsal claw	http://purl.obolibrary.org/obo/HAO_0000989

Abbreviations		**URI**
	tarsomere	http://purl.obolibrary.org/obo/HAO_0000991
	tarsus	http://purl.obolibrary.org/obo/HAO_0000992
	tendon	http://purl.obolibrary.org/obo/HAO_0000996
	terga	http://purl.obolibrary.org/obo/HAO_0001006
	tergite	http://purl.obolibrary.org/obo/HAO_0001005
	basal tooth	http://purl.obolibrary.org/obo/HAO_0001219
	trochantellus	http://purl.obolibrary.org/obo/HAO_0001033
	trochanter	http://purl.obolibrary.org/obo/HAO_0001034
	vein	http://purl.obolibrary.org/obo/HAO_0001095
	vertex	http://purl.obolibrary.org/obo/HAO_0001077
	wing	http://purl.obolibrary.org/obo/HAO_0001089
	wing cell	http://purl.obolibrary.org/obo/HAO_0001091